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ONTARIO GEOLOGICAL SURVEY

Open File Report 6006

Report of Activities, 1999
Resident Geologist Program

Timmins Regional Resident Geologist Report:
Timmins and Sault Ste. Marie Districts

by

B.T. Atkinson, M.H. Hailstone, C.B. Ravnaas, A.C. Wilson, D.M. Draper, P. Hope, P.M. Morra and S.A. Beauchamp

2000

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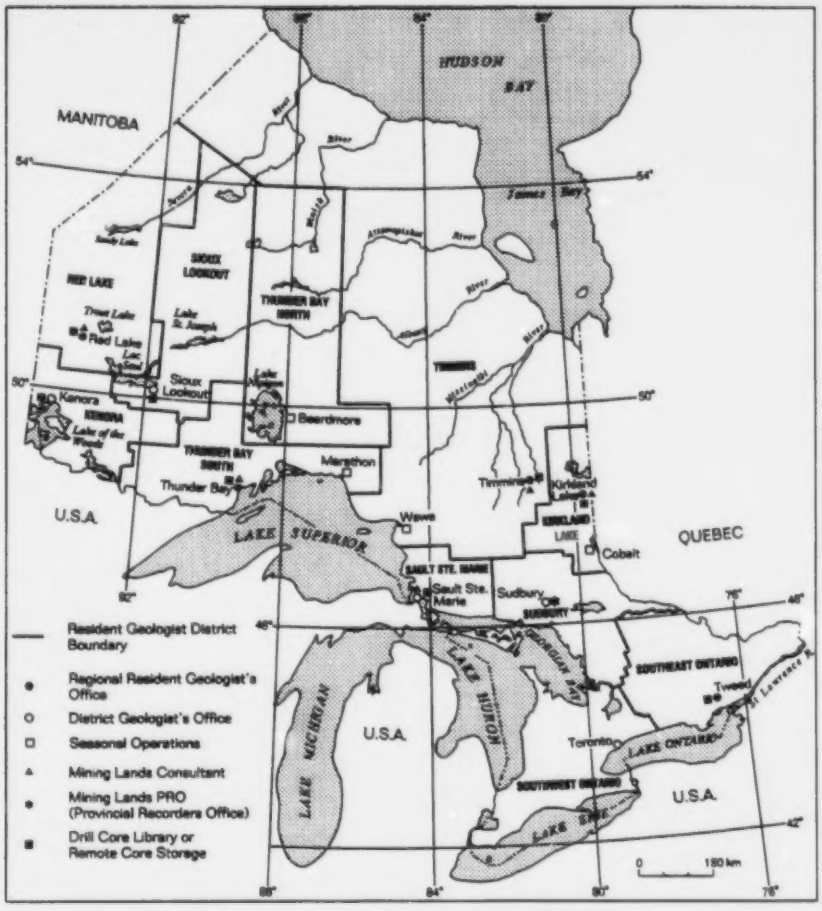

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ONTARIO GEOLOGICAL SURVEY

RESIDENT GEOLOGIST PROGRAM

REPORT OF ACTIVITIES—1999

TIMMINS REGIONAL RESIDENT GEOLOGIST REPORT

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Regional Resident Geologist Program

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by

B.T. Atkinson, D.M. Draper, P. Hope and S.A. Beauchamp

2000

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TIMMINS REGIONAL RESIDENT GEOLOGIST DISTRICT (TIMMINS AREA)–1999

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[1]Timmins Regional Resident Geologist, Ontario Geological Survey

[2]Timmins Regional Support Geologist, Ontario Geological Survey

[3]Timmins District Support Geologist, Ontario Geological Survey

[4]Timmins Contract Geologist

INTRODUCTION

With the opening of the Kapuskasing Phosphate Operations in July by Agrium Inc., the Timmins district became the first commercial-scale phosphate producing area in Canada. Originally discovered in the 1954, it wasn't until 1998 that a production decision was made to mine the deposit. Mine and mill construction were completed at a cost of $100 million over the last eighteen months.

Diamond exploration continued throughout the district. At Attawapiskat, Monopros Limited extracted a 300 ton bulk sample from the Victor kimberlite pipe to evaluate the diamond content. In the area extending from Wawa to Kapuskasing, several companies and individuals explored for diamond-bearing kimberlite and toward year end, much interest was being directed to the area.

The Detour Lake Mine ceased production and closed in July. Gold mining suffered a further decline as a result of the closure of Royal Oak Mines' – Timmins Operations in September. Presently, the Dome Mine and Hoyle Pond Mine are producing gold in Timmins and the Eagle River Mine and Edwards Mine are producing gold near Wawa.

The Kidd Creek Mine continued production of base metals through the year but temporarily ceased smelting and refining at the Kidd Metallurgical Site due to a month long strike by employees in July. Late in December, copper production was temporarily suspended for plant maintenance.

Summary statistics of claim recordings and assessment work for 1999 are indicated in Table 1. These figures indicate claim recordings were comparable to the previous year but claim cancellations increased by over 5200 claim units, resulting in a significant reduction in the number of active claims. Likewise, the value of assessment work reported declined by more than $6 million or 60% over the previous year.

The Ontario Prospectors Assistance Program (OPAP) funded 50 designated projects in the Timmins district with a total value of $720 416. Eleven OPAP grants were for Wawa area projects.

Separate chapters within this report describe activities for the Wawa area and the Sault Ste. Marie District.

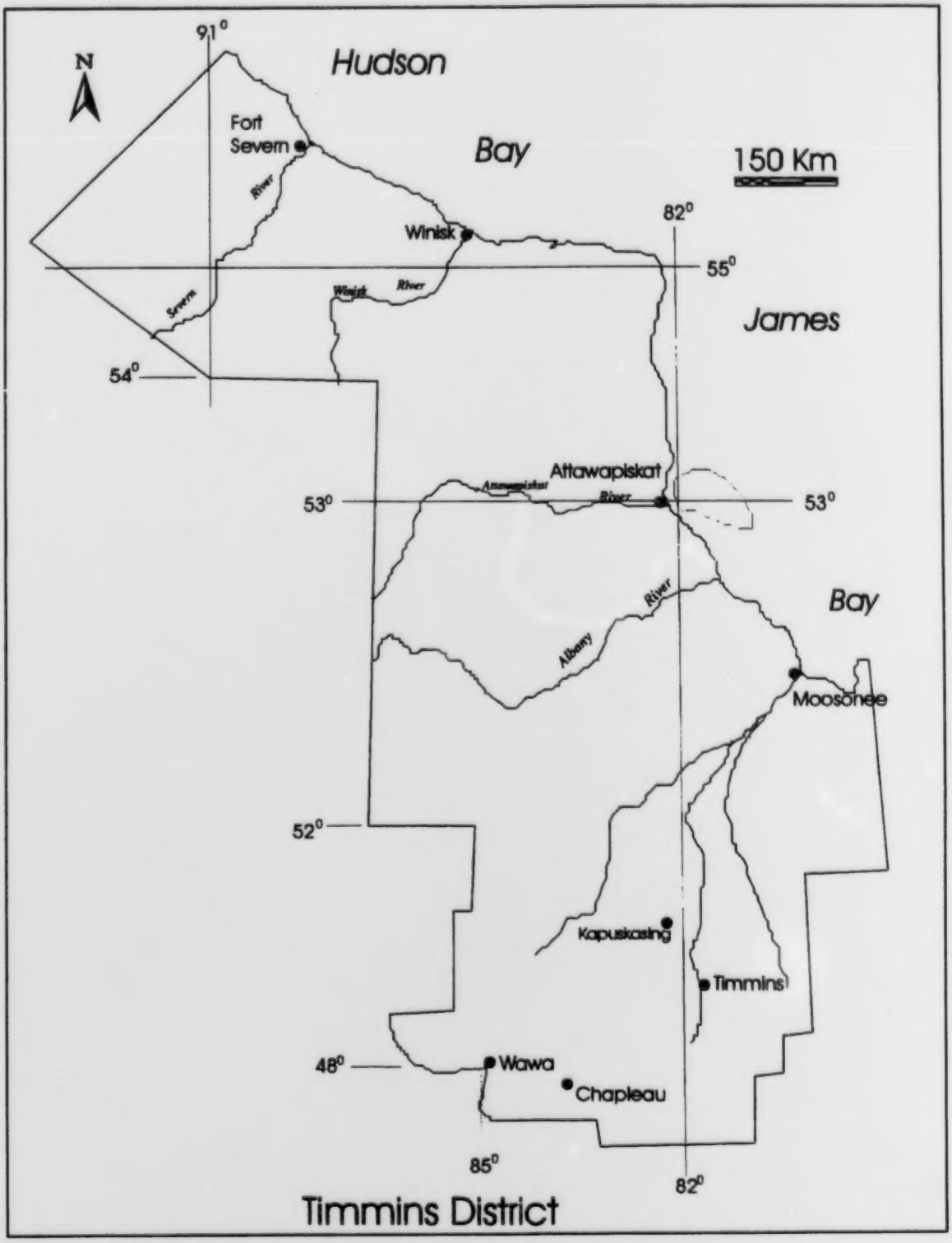


Figure 1. Timmins Regional Resident Geologist District.

Figure 2a
TIMMINS RESIDENT
GEOLOGIST'S DISTRICT
(NORTH WEST PART)

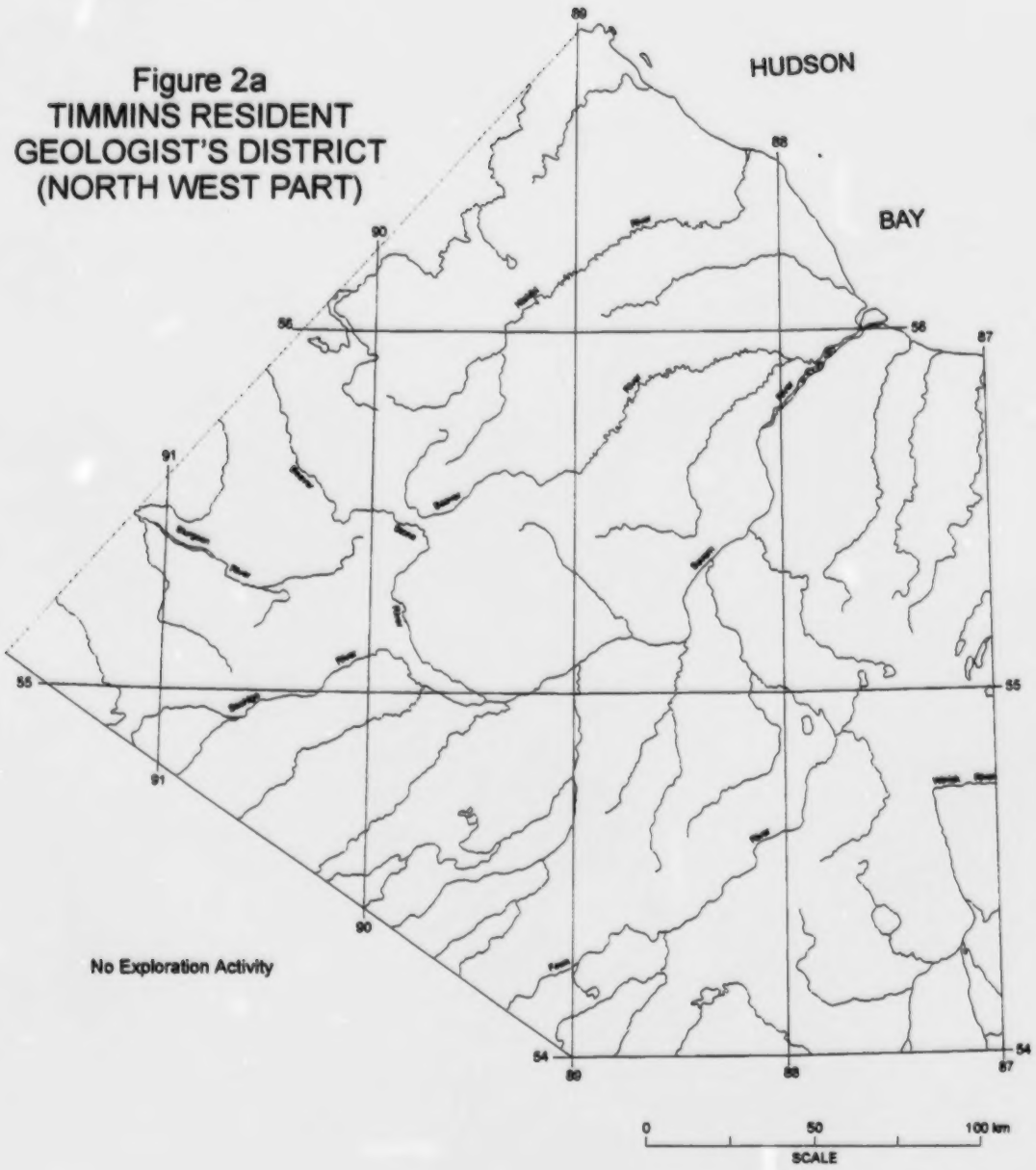


Figure 2b
TIMMINS RESIDENT GEOLOGIST'S DISTRICT (NORTH EAST PART)

No Exploration Activity

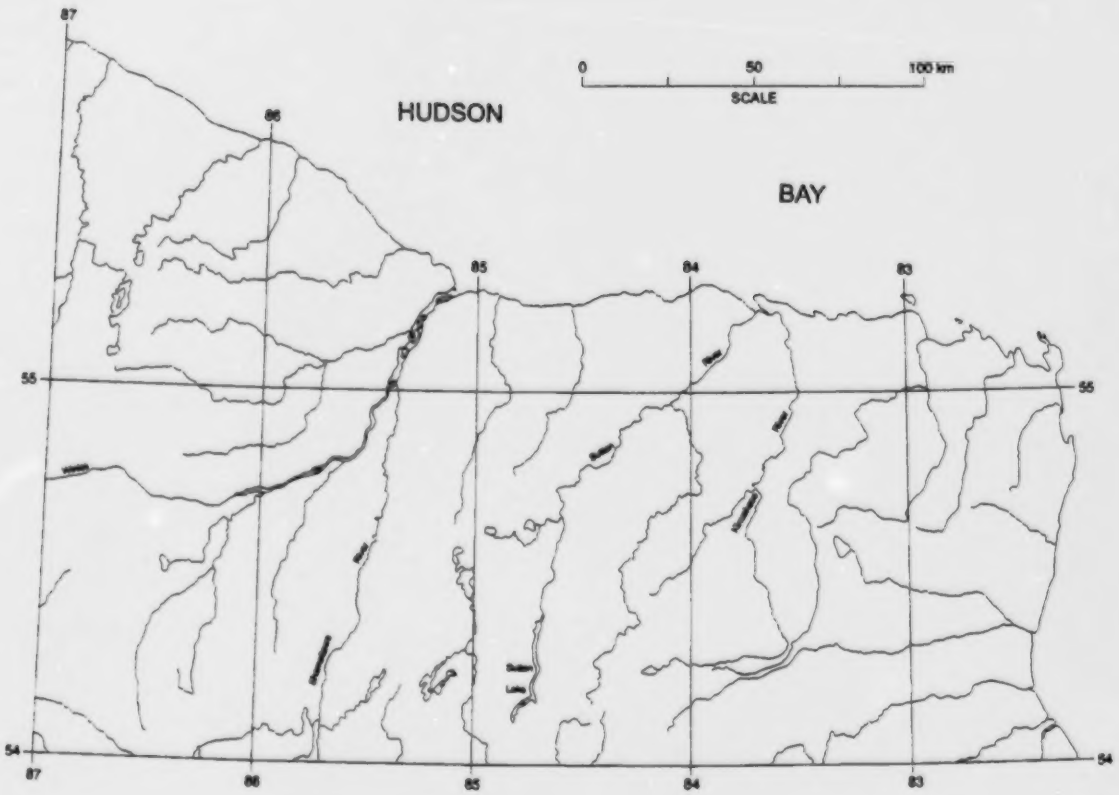
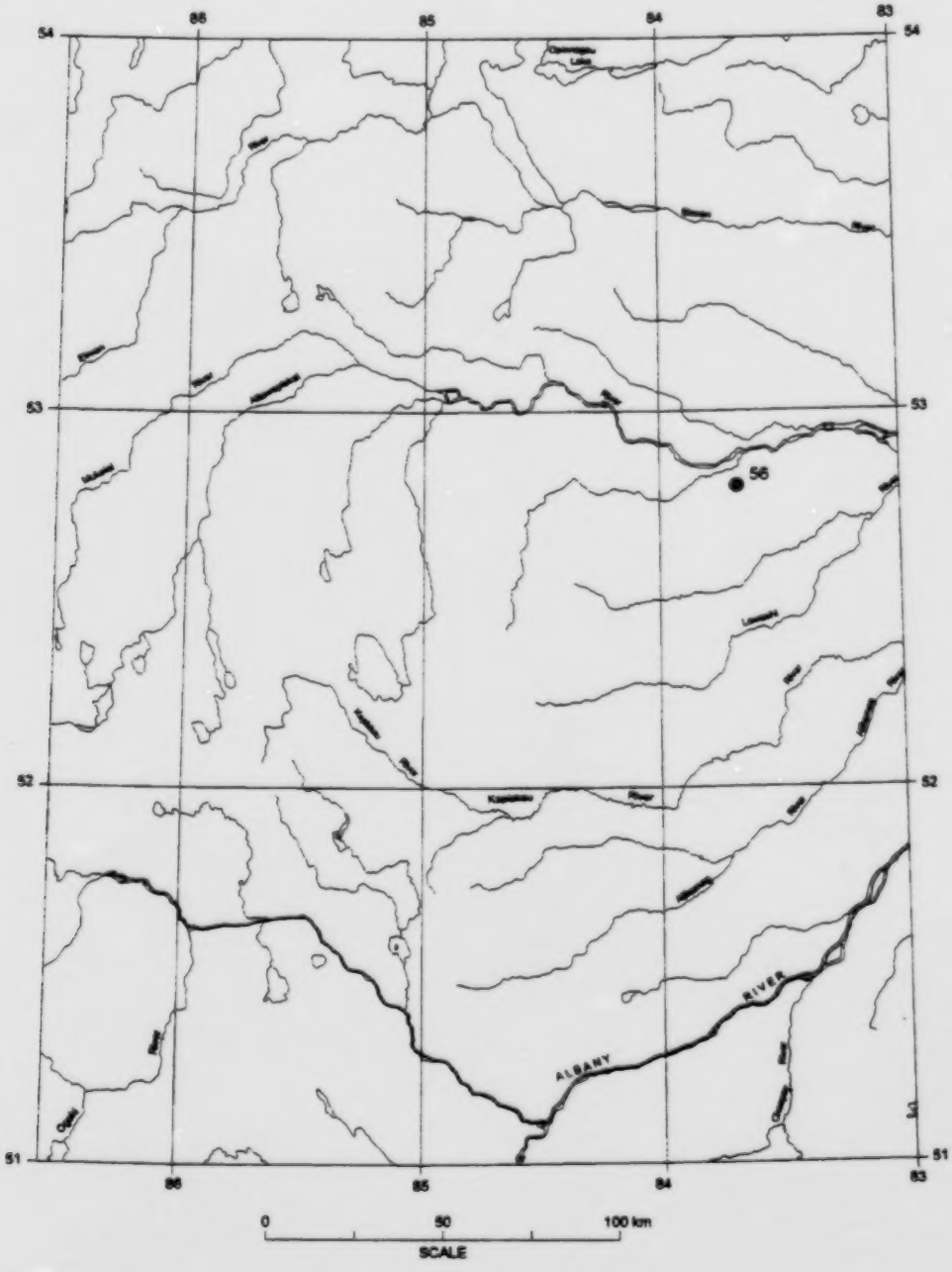


Figure 2c
TIMMINS RESIDENT GEOLOGIST'S DISTRICT
(WEST CENTRAL PART)



● 1 Exploration Program (Keyed to Table 4)

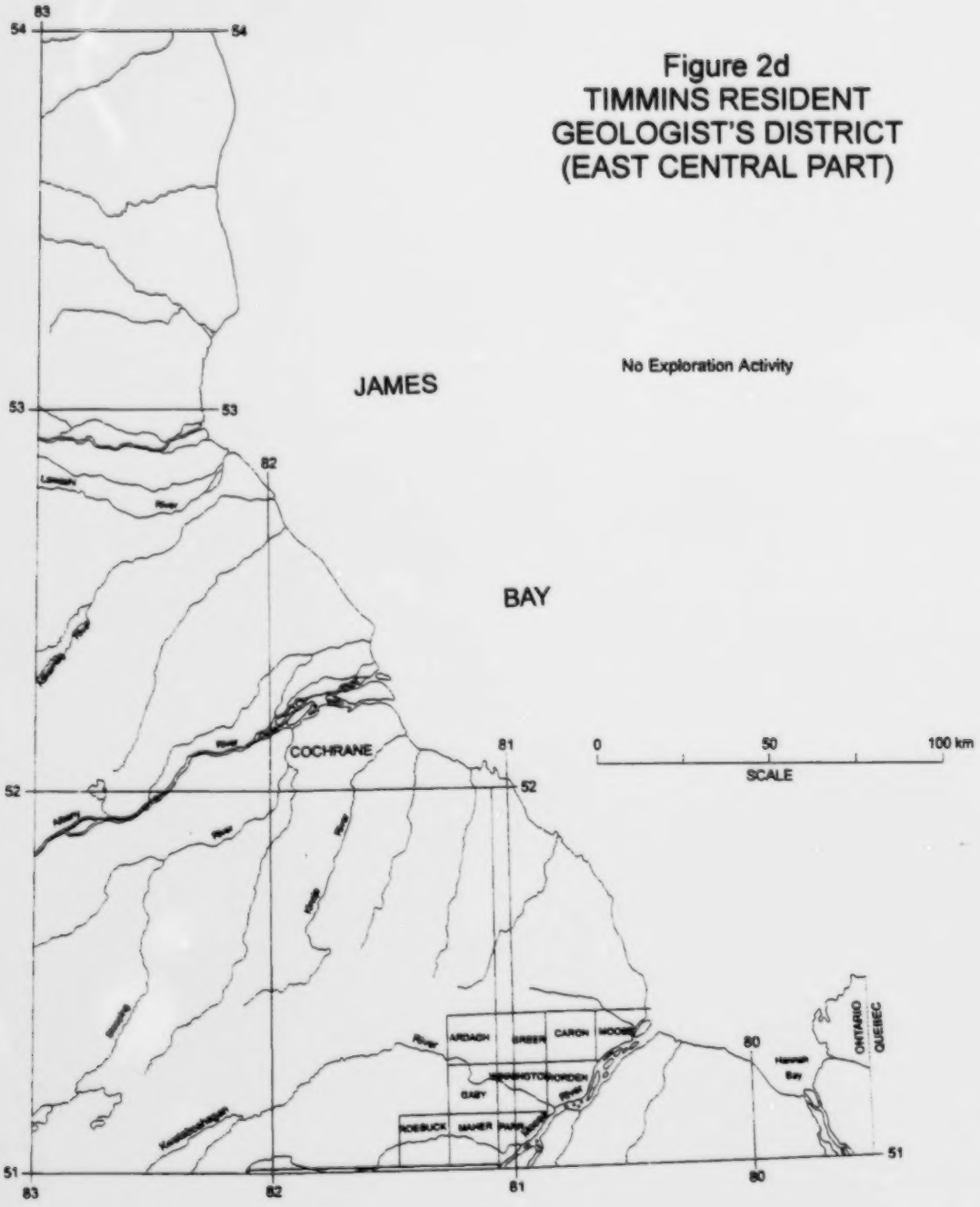


Figure 2d
TIMMINS RESIDENT
GEOLOGIST'S DISTRICT
(EAST CENTRAL PART)

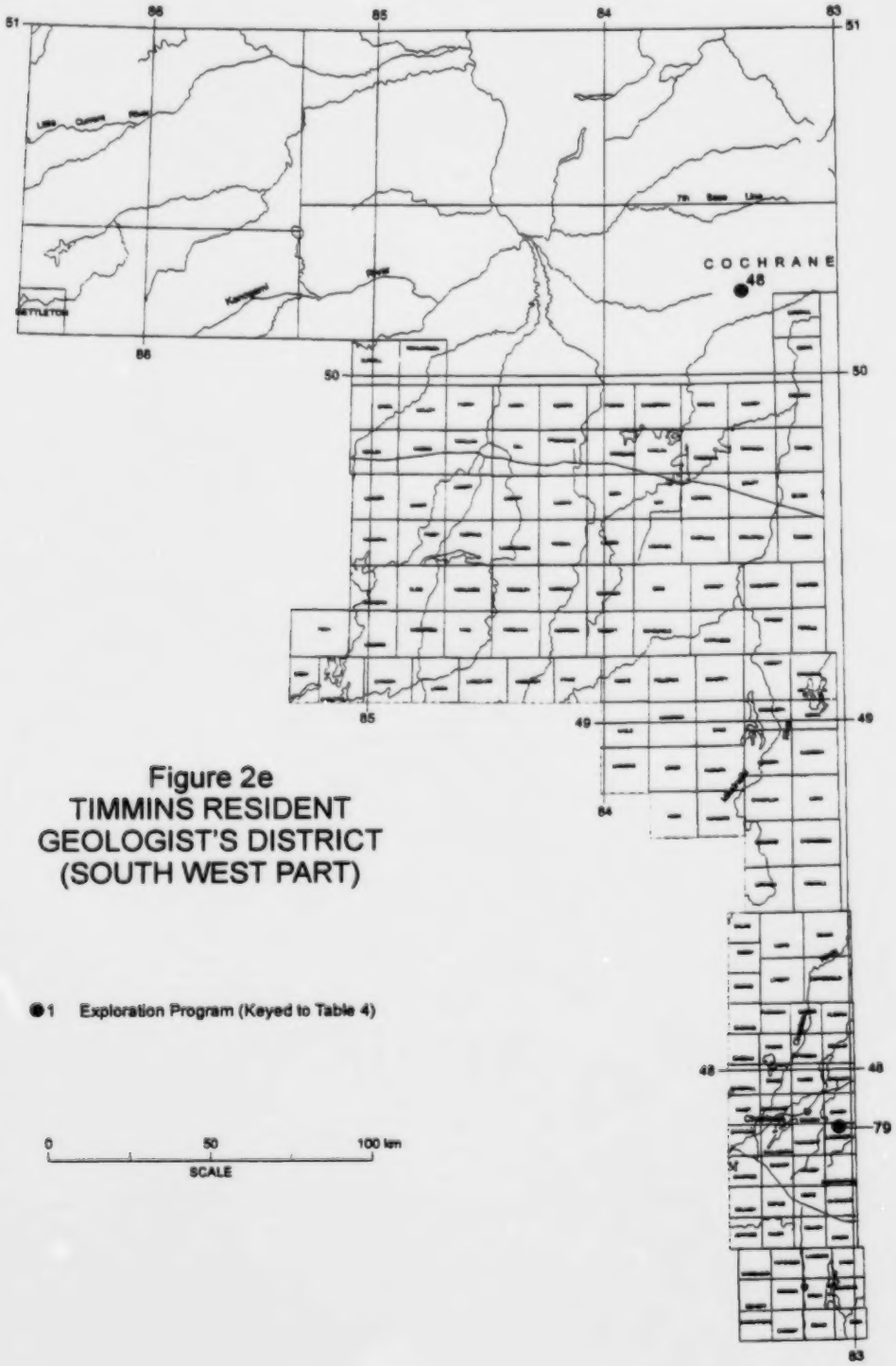


Figure 2e
TIMMINS RESIDENT
GEOLOGIST'S DISTRICT
(SOUTH WEST PART)

●1 Exploration Program (Keyed to Table 4)

0 50 100 km
SCALE

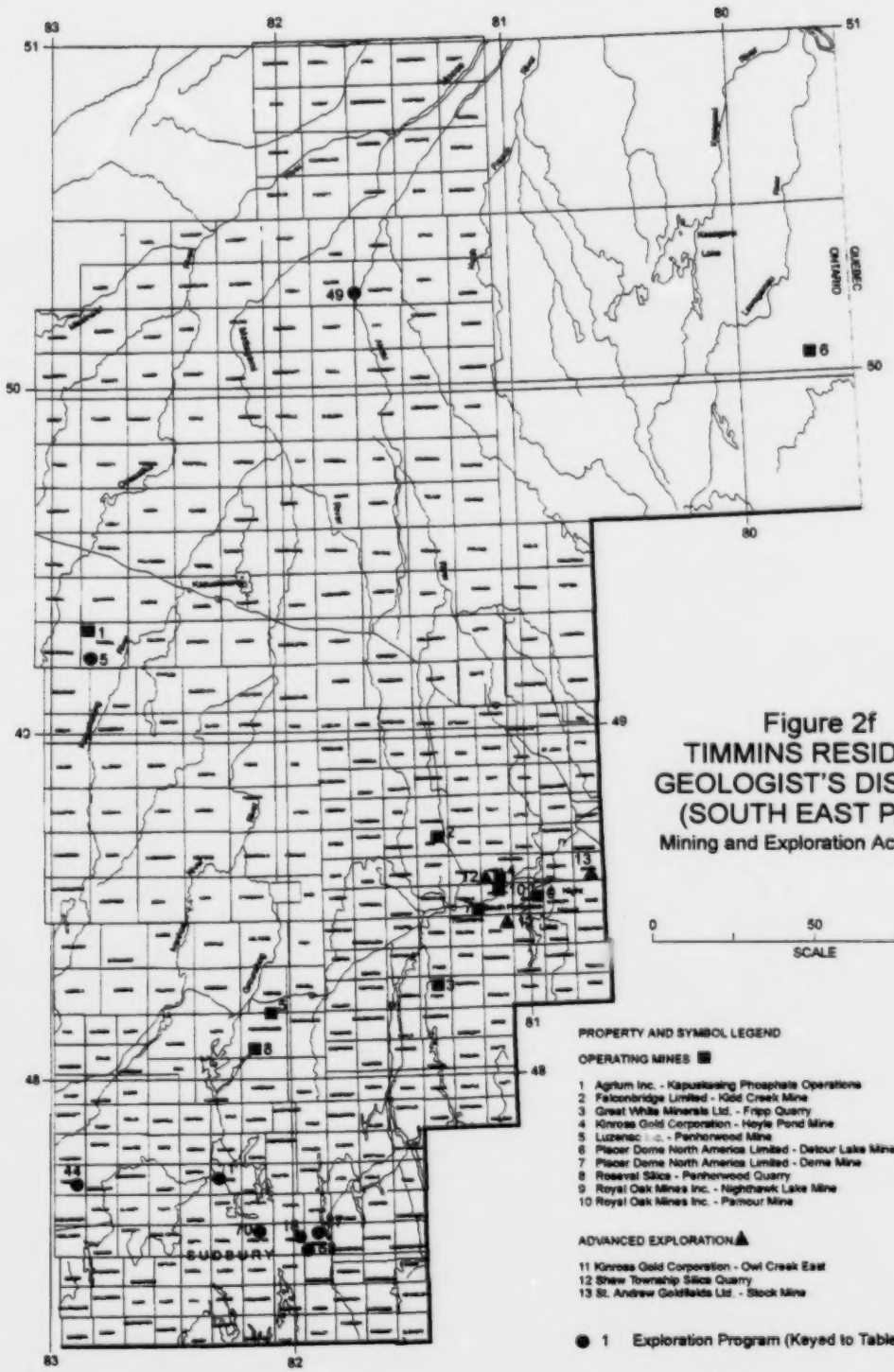


Figure 2f
TIMMINS RESIDENT GEOLOGIST'S DISTRICT (SOUTH EAST PART)
Mining and Exploration Activity, 1999

0 50 100 km
SCALE

PROPERTY AND SYMBOL LEGEND

OPERATING MINES ■	Commodity
1 Agrium Inc. - Kapuskasing Phosphate Operations	phosphate
2 Falconbridge Limited - Kidd Creek Mine	Cu, Zn, Ag, Pb
3 Great White Minerals Ltd. - Fripp Quarry	Si, Aggregate
4 Kinross Gold Corporation - Hoyle Pond Mine	Au
5 Luzenac [illegible] - Penhorwood Mine	talc
6 Placer Dome North America Limited - Detour Lake Mine	Au (closed in '99)
7 Placer Dome North America Limited - Dome Mine	Au
8 Roseval Silica - Penhorwood Quarry	Si
9 Royal Oak Mines Inc. - Nighthawk Lake Mine	Au (closed in '99)
10 Royal Oak Mines Inc. - Pamour Mine	Au (closed in '99)

ADVANCED EXPLORATION ▲	
11 Kinross Gold Corporation - Owl Creek East	Au
12 Shew Township Silica Quarry	Si
13 St. Andrew Goldfields Ltd. - Stock Mine	Au

● 1 Exploration Program (Keyed to Table 4)

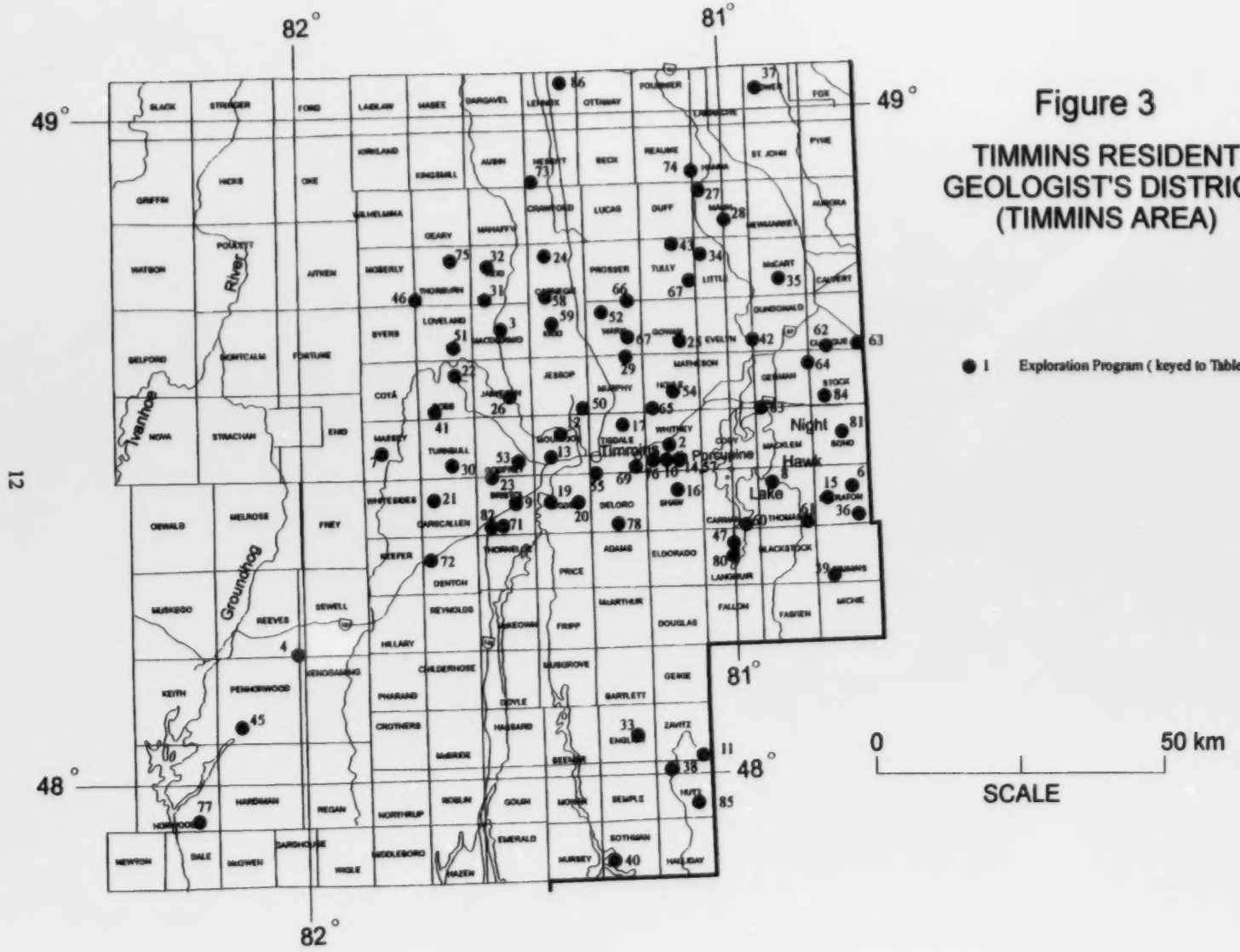


Figure 3

TIMMINS RESIDENT GEOLOGIST'S DISTRICT (TIMMINS AREA)

● 1 Exploration Program (keyed to Table 4)

TIMMINS DISTRICT–1999

Table 1. Summary of claims recorded and assessment work credit in the Timmins District, 1992-1999.

Year	Claims Units Recorded	Claim Units Cancelled	Claims Units Active	Diamond Drilling ($)	Physical Work ($)	Geotechnical Work ($)	Total ($)
1999	12 312	16 557	42 270	N/A*	N/A*	N/A*	10 665 577
1998	12 642	11 300	46 515	N/A*	N/A*	N/A*	17 308 110
1997	10 771	16 908	45 173	N/A*	N/A*	N/A*	10 707 864
1996	13 859	15 876	50 739	4 788 424	216 812	3 288 156	8 418 072
1995	14 376	7 769	60 705	2 003 632	202 191	2 742 497	5 052 359
1994	19 738	6 689	47 497	1 577 945	310 392	1 251 400	3 186 244
1993	7 852	3 191	34 779	2 016 974	909 810	1 439 217	4 437 645
1992	10 474	2 248	28 987	807 799	253 137	1 245 578	2 323 218

* N/A Not Available. *Figures no longer reported*

MINING ACTIVITY

Agrium Inc. brought the Kapuskasing Phosphate Operation into production in July with the construction of an open pit mine and mill complex in Cargill Township, located 40 km southwest of Kapuskasing.

Kinross Gold Corporation produced gold at the Hoyle Pond Mine throughout the year. Placer Dome Inc. operated the Dome Mine through the entire year, but closed the Detour Lake Mine in July as a result of ore depletion. Royal Oak Mines Inc. operated both the Pamour and Nighthawk mines until September when the company ceased operations as a result of bankruptcy. At year end, Kinross Gold Corporation acquired the Royal Oak Mines - Timmins Operations. The Kidd Creek Mine operated throughout the year and a feasibility study on mining deep levels beneath existing workings continued.

Luzenac Inc. continued to produce talc from the Penhorwood Mine, located 80 km west of Timmins.

Details of mining operations are described below and mine locations are presented in Figure 2. Table 2 lists mine production for 1998 and 1999 and summarises ore reserves for each active mine in the district. Table 2a presents historical gold production and Table 2b provides historical base metal production from the Timmins area.

Table 2. Mine production and reserves in the Timmins District.

Mine	Production in 1999		Production in 1998		Reserves at end of 1999	
	Tonnage @ Grade	Total Commodity	Tonnage @ Grade	Total Commodity	Tonnage	Grade
Falconbridge Limited, Kidd Creek Mine	2 424 471 tonnes @: 2.85% Cu, 5.04% Zn, 0.11% Pb 61 g/t Ag	69 097 tonnes Cu concentrate 122 193 tonnes Zn concentrate 4 764 585 oz Ag	2 550 873 tonnes @: 2.78% Cu, 5.01% Zn, 0.18% Pb, 66 g/t Ag	As concentrate: 128 000 tonnes Zn 71 000 tonnes Cu 3 900 000 oz Ag (estimated)	30 996 000 tonnes** incl: proven 19 213 000t probable 10 311 000t possible 1 472 000t	2.33% Cu, 5.94% Zn, 62 g/t Ag
Kinross Gold Corporation, Hoyle Pond Mine	419 108 tonnes @ 11.51 g/t	136 328 oz Au	424 378 tonnes @ 13.17 g/t Au	158 953 oz Au	3 734 000 tonnes incl 290 000 t@ 12.7 proven, 443 000 @ 10.7 g/t prot 533 000t @ 11.2 g/t possible	6.3 g/t
Luzenac Incorporated, Penhorwood Mine	162 479 tonnes @ 31.3% talc	50 808 tonnes talc	110 142 tons @ 35% talc	38 632 tons talc	4 902 000 tonnes incl. 3 506 000 t proven, 1.398 Mt probable and resource of 18.856 Mt incl. 13.477 Mt measured and 5.379 Mt indicated	45-50% talc
Placer Dome North America - Detour Lake Mine	620 520 tonnes @ 3.38 g/t	61 453 oz Au	1 356 439 tonnes @ 3.51 g/t Au	140 530 oz Au	-	-
Placer Dome North America - Dome Mine	4 747 323 tons @ 0.074 opt Au	328 149 oz Au	4 691 426 tons @ 0.077 opt Au	328 939 oz Au	33 040 000 tons* incl 10 050 000 tons proven 22 990 000 tons probable *	0.052 opt Au
Royal Oak Mines Inc. Nighthawk Mine	137 000 tons @ 0.12 opt Au	14 200 oz Au	318 610 tons @ 0.116 opt Au	31 736 oz Au	101 114 tons incl 30 276 tons probable and 70 839 tons possible	0.195 opt Au
Royal Oak Mines Inc. Pamour Mine	787 600 tons @ 0.06 opt Au	39 690 oz Au	1 077 216 tons @ 0.067 opt Au	61 220 oz Au	69 771 696 tons incl 25 953 450 tons probable 43 818 246 tons possible	0.042 opt Au

Notes:

Abbreviations: N/A – *Data not available;* g/t – *grams per tonne;* opt – *ounces per ton.*

* *Proven and probable reserves* ** *Total of proven, probable and possible reserves.*

Reserve figures indicated for Pamour Mine are 1998 data

Table 2a. Gold Production in the Timmins Resident Geologist District to the end of 1999.

Mine Name	Township	In Production	Tons Milled	Oz. Au	Grade *
Ankerite/Marsh	Deloro	1926-1935	317 769	61 039	0.19
Aquarius	Macklem	1984, 1988-89	139 634	27 117	0.19
Aunor Pamour(#3)	Deloro	1940-1984	8 482 174	2 502 214	0.30
Banner	Whitney	1927-28,-33,-35	315	670	0.13
Bell Creek	Hoyle	1987-91 1992-94	576 017	112 739	0.196
Bonetal	Whitney	1941-51	352 254	51 510	0.15
Bonwhit	Whitney	1951-54	200 555	67 940	0.34
Broulan Porcupine	Whitney	1939-1953	1 146 059	240 660	0.21
Broulan Reef Mine	Whitney	1915-65	2 144 507	498 932	0.23
Buffalo Ankerite	Deloro	1926-53, 78	4 993 929	957 292	0.19
Cincinnati	Deloro	1914, 1922-24	3 200	736	0.23
Concordia	Deloro	1935	230	16	0.07
Consurum/Carium	Tisdale	1913-18, 1928-61	4 464 006	1 109 574	0.25
Crown	Tisdale	1913-21	226 180	138 330	0.61
Davidson-Tisdale	Tisdale	1918-20 1988	9 371 43 850	2 438 7 301	0.26
Dehnite (open pit)	Deloro	1937-64 1987-88	3 847 364 56 067	920 404 3 602	0.20 0.77
DeSantis	Ogden	1933, 39-42, 61-64	196 928	35 842	0.18
DeSantis	Tarbutt	1926	NA		NA
Detour Lake	Sunday Lake Area	1983-99	16 005 557	1 781 858	0.111
Dome	Tisdale	1910-	75 187 047	13 920 896	0.185
Feymar	Deloro	1940-42	119 181	21 851	0.180
Fuller (Vedron)	Tisdale	1940-44	44 028	6 566	0.15
Gillies Lake	Tisdale	1921-31, 35-37	54 502	15 278	0.28
Goldhawk (open pit)	Cody	1947 1980	636 40 000	53 3 967	0.08 0.10
Hakrow-Swayze	Hakrow	1935	211	40	0.19
Halbor (Pamour #2)	Whitney	1938-48, 81	4 226 419	1 690 560	0.40
Hollinger- Schumacher	Tisdale	1915-1918	112 124	27 182	0.24
Hollinger Pamour Timmins Property	Tisdale	1910-68 1976-88	65 778 234 2 615 866	19 327 691 182 058	0.29 0.07
Hoyle – Falconbridge	Whitney	1941-44,46-49	725 494	71 843	0.10
Hoyle Pond	Hoyle	1985-	3 187 886	1 299 638	0.41
Hugh-Pam	Whitney	1926, 48-65	636 751	119 604	0.19
Jerome	Otway	1941-43, 56	335 060	56 893	0.17
Joburke	Keith	1973-75, 79-81	440 117	43 571	0.10
Kingbridge/Gemak	Chester	1935-36	1 387	98	0.07
Marbill	Hoyle	1989-91	156 800	30 924	0.199
McIntyre Pamour Schumacher (ERG Tailings recovery)	Tisdale	1912-88 1988-89	37 634 691 2 549 189	10 751 941 18 260	0.29
McLaren	Deloro	1933-37	876	201	0.23
Monata	Tisdale	1938-43	314 829	149 250	0.47
Naybob (Kenilworth)	Ogden	1932-64	304 100	50 731	0.17
Nighthawk	Macklem	1995-99	1 479 607	175 803	0.12
Owl Creek	Hoyle	1981-89	1 984 400	236 880	0.12
Pamour #1 (Incl. pits 3, 4 & 7) Pamour/Hoyle	Whitney	1936-99	45 795 863	4 078 525	0.09
Pamour (other sources)	Whitney	1936-99	7 416 634	676 645	0.091
Paymaster	Deloro	1915-19, 22-66	5 607 402	1 192 206	0.21
Porcupine Lake (Hunter)	Whitney	1937- 40,- 44	10 821	1 369	0.13
Porcupine Peninsular	Cody	1924-27,-40,-47	99 688	27 354	0.27
Preston	Tisdale	1938-68	6 284 405	1 539 355	0.24
Preston NY	Tisdale	1933	2 800	153	0.05
Preston/Porcupine Pet	Deloro	1914-15	NA	314	
Preston/Porphyry Hill	Deloro	1913-15	46	312	6.78
St. Andrew Goldfields – Stock	Stock	1989-94	758 000	119 000	0.19
Tionaga/Smith Thorne	Harwood	1938-39	6 653	2 299	0.35
Tisdale Ankerite	Tisdale	1952	14 655	2 236	0.15
Tommy Burns/ Arcadia	Shaw	1917	21	14	0.28
Vigrond	Tisdale	1911-41	1 565 218	414 367	0.26
Total			308 606 994	68 776 142	0.313

** Grade = ounce gold per ton*

Table 2b. Base metal production from the Timmins Regional Resident Geologist District to the end of 1999.

Mine Name	Township	In Production	Ore Milled	Grades
Alexo	Dundonald	1912-19	51 857 tons	4.5% Ni, 0.55% Cu
		1943-44	4 923 tons	
Canadian Jamieson	Godfrey	1966-71	816 173 tons	2.44% Cu, 4.22% Zn
Jameland	Jamieson	1969-72	509 356 tons	0.99% Cu, 0.88% Zn
Kam Kotia	Robb	1943-44	6.6 Mtons	1.1% Cu, 1.17% Zn,
		1961-72		0.10 oz/T Ag
Kidd Creek	Kidd	1966-	129.7 Mtons	2.40% Cu, 6.63% Zn,
				0.27% Pb, 83 g/t Ag
Langmuir #1	Langmuir	1990-91	111 502 tons	1.74% Ni
Langmuir #2	Langmuir	1972-78	1.1 Mtons	1.43% Ni
McIntyre	Tisdale	1963-82	10 Mtons	0.67% Cu
Redstone	Eldorado	1989-92	294 895 tons	2.4% Ni
		1995-96	10 228 tons	1.7% Ni
United Obalski	Godfrey	1966	Produced 240 tons Cu concentrate	

Gold Mining

Kinross Gold Corporation — Hoyle Pond Mine

At the Hoyle Pond Mine, in Hoyle Township, Kinross Gold Corporation produced 136 328 ounces of gold from 419 108 tonnes of milled ore for an average annual production grade of 11.51 g/t gold. The mill operated at a rate of 1200 tons per day and gold recovery was 87.9%.

In 1999, ore reserves at the Hoyle Pond Mine were as follows:

Category	Tons	Grade (g/t) gold
Proven	290 000	11.4
Probable	443 000	10.7
Possible	533 000	11.2
Total	1 286 000	11.4

Total resources amount to 3 734 000 tonnes with a grade of 6.3 g/t gold.

Underground mining operations included 14 546 m of drifting and 454 m of raises. Mining was carried out on 18 levels with 67 active headings. The mining methods used include longhole, shrinkage, cut and fill and panel mining. Underground drilling amounted to 21 686 m for ore definition and 85 700 m of exploration drilling. Surface diamond drilling included 1204 m for ore definition.

During the year, the ramp was advanced to the 500 m elevation with cross-cuts driven on 340, 400, 420, 460 and 480 m levels. The 720 and 950 ore zones were accessed for development. Development drives were completed on the N Zone, Fold Nose and 507 Access zones. Exploration expenditures amounted to $3.9 million and diamond drilling was done to evaluate the 950 Zone from the 440 and 720 m levels. Delineation drilling targeted the 1060 B1, B1 North, B3, North Zone and Lower Porphyry Zone below the 360 m level. The main Hoyle Pond vein structures were tested by diamond drilling between the 280 and 500 m levels. A large resource block of mineralization on the sediment vein was delineated from the 355 m level.

A pre-feasibility study to examine mill recovery of refractory ore was initiated and a new mine dry and office complex were constructed.

On the Owl Creek East Project, 683.4 m of ramping was followed by 983.4 m of underground drilling and the extraction of a 4793 tonne bulk sample.

The mine has a work force of 293. D. McKinnon is the Mine Manager and K. Green is the Chief Geologist.

Placer Dome North America — Detour Lake Mine

As a result of ore depletion, Placer Dome ceased mining operations at the Detour Lake Mine on June 15th and milling operations ended on July 15th. Subsequently, decommissioning and minesite rehabilitation continued through the year.

The Detour Mine produced 61 453 ounces of gold from 620 520 tonnes of ore in 1999, its last year of operation. The ore grade was 3.38 grams per tonne. The life of mine production amounted to 1 781 858 ounces of gold from 16 005 557 tonnes of ore with an average mine grade of 0.111 ounces per ton.

Placer Dome North America — Dome Mine

The Dome Mine in Tisdale Township produced 328 149 ounces of gold from 4 747 323 tons of ore milled. Ore grade was 0.074 ounce gold per ton and the daily milling rate from combined open pit and underground operations was 13 006 tons. The mill achieved a recovery rate of 93.82% gold.

Ore reserves at the Dome Mine are as follows:

Category	Tons	Grade (ounce per ton gold)
Proven	10 050 000	—
Probable	22 990 000	—
Total	33 040 000	0.052

Underground development included 18 056 feet of drifting and 1398 feet of raising. Operations were carried out on 30 levels. Mining methods include open pit operations and both longhole open stoping and cut–and-fill methods underground. Underground drilling totalled 120 091 feet of ore definition drilling and 174 254 feet of exploration drilling.

Mine site rehabilitation included contouring and revegetation of 49 acres of disturbed area as part of a progressive mine rehabilitation plan. During the year, the Dome Mine successfully developed technology that includes the addition of EDTA (ethylene diamide tetracetic acid) to chelate metals in mine effluent to render them non-toxic to aquatic organisms.

Evaluation of the neighbouring Paymaster and Preston mine properties in Tisdale and Deloro townships by diamond drilling continued. Surface exploration diamond drilling amounted to 16 216 feet on four properties adjacent to the Dome Mine.

The Dome Mine has a work force of 510 people. K. Boyle is the Mine Manager and M. Shannon is Chief Geologist.

Royal Oak Mines Inc. — Timmins Division Nighthawk Mine

The Nighthawk Mine was operated as a satellite operation to the Pamour Mine and closed on September 1st, 1999 as a result of bankruptcy of Royal Oak Mines Inc. For 1999, gold production amounted to 14 200

ounces from 137 000 tons of ore with a grade of 0.12 ounce gold per ton. Mining operations included 5450 feet of drifting and 225 feet of raising. The mine had 25 active headings on 6 levels. The Nighthawk Mine contributed 570 tons per day to the Pamour mill and the gold recovery was 86.7%.

Royal Oak Mines Inc. — Timmins Division Pamour Mine

Gold production at the Pamour Mine amounted to 39 600 ounces from 787 600 tons of ore milled. The average ore grade was 0.06 ounce per ton gold and the mill processed 3280 tons of ore per day. Gold recovery was 84.2 %.

Ore reserves at the Pamour Mine at the end of 1998 were as follows:

Category	Tons	Grade (ounce per ton gold)
probable	25 953 450	0.042
possible	43 818 246	0.042
Total	69 771 696	0.042

Mining operations included open pit and underground shrinkage and vertical crater retreat methods. A total of 7600 feet of drifting and 1340 feet of raising was completed in the underground workings.

As a result of bankruptcy, Royal Oak Mines Limited - Timmins Operations ceased in September 1999. At year end, Kinross Gold Corporation acquired the Royal Oak – Timmins Operations.

Base Metals

Falconbridge Limited — Kidd Creek Mine and Metallurgical Complex

Falconbridge Limited operates the Kidd Creek Mine located in Kidd Township and the Kidd Metallurgical Complex in Hoyle and Whitney townships. Ore from the Kidd Creek Mine is transported via rail to the Metallurgical Complex for smelting and refining.

The Kidd Creek Mine produced 2 424 471 tonnes of ore grading 2.85% Cu, 5.04% Zn, 0.11% Pb and 61 g/t Ag. The daily mining rate was 7500 tonnes.

Ore reserves at year end are:

Category	Tonnes	Cu%	Zn%	Ag g/t
Proven	19 213 000	2.33	5.94	62
Probable	10 311 000	2.29	5.57	54
Possible	1 472 000	3.43	3.76	63
Total	30 996 000	2.33	5.94	62

Underground mining operations included 3606 m of drifting and 2718 m of raising. Ore was mined on 25 levels of the mine with 60 active headings. Extraction methods used included long hole and open stope mining with cemented rock backfill. Underground drilling amounted to 25 792m of ore definition drilling and 12 659m of exploration drilling.

A pre-feasibility study completed on the "D Mine", between the 6800 and 8400 foot levels indicated an additional 9.9 million tons of ore is deemed mineable. Mining of the D Mine would extend the mine life to the year 2015.

At the Kidd Metallurgical Complex, a $1.8 million expansion to the copper refinery increased capacity by10 per cent. The refinery has a production capacity of 140 000 tonnes of copper metal per year. Ore handling facilities at the site are being modified to accommodate incoming ore concentrates for custom smelting and refining.

Combined, the Kidd Creek Mine and Metallurgical sites employ 1650 people. The Mine employs 670 people. D. Gignac is the General Manager of the Mining Division and C. Ferron is General Manager of the Metallurgical Division. D. Duff is the Manager of Geology.

INDUSTRIAL MINERALS

Agrium Inc. - Kapuskasing Phosphate Mine

The Agrium Kapuskasing Phosphate mine is located 40 km southwest of Kapuskasing in Cargill Township. The Cargill carbonatite complex that hosts the phosphate deposit was originally discovered in 1954 during exploration for base metal mineralization. In the 1970's exploration focused on the residual phosphate that overlies the carbonatite. Efforts toward developing the deposit as a source of phosphate for fertilizer were not completed until the recent merger of Agrium Inc. with Viridian Inc. (the latter company being the fertilizer division of Sherritt Gordon Mines Ltd.). The combination of the company merger in 1997 and improving phosphate economics resulted in a production decision for the deposit in 1998 by Agrium. Exploration had outlined four zones of phosphate concentration, these are referred to as the Main, A, B and C zones, and are depicted in Figure 4. These zones have sufficient reserves for a thirteen year mine life. Total proven and probable reserves are 21 million tons at 28% P_2O_5. A cross-sectional view through the Main Zone and the mine pit is presented in Figure 5.

In 1999, the Kapuskasing Phosphate Operations produced 96 331 tons of phosphate concentrate with a grade of 29.7% P_2O_5 from 392 000 tonnes of ore milled. Mining is by conventional open pit and surface exploration drilling amounted to 3242 m. Mill commissioning was under way in the 3rd and 4th quarters of the year with additions and modifications to the mill and tailings dam. The mill has an hourly production capacity of 300 dry metric tonnes.

The mine directly employs a workforce of 75 people and an additional 160 contractors work on site. J. Gagne is the Mine Superintendent and R. Pressacco is the Mine Geologist.

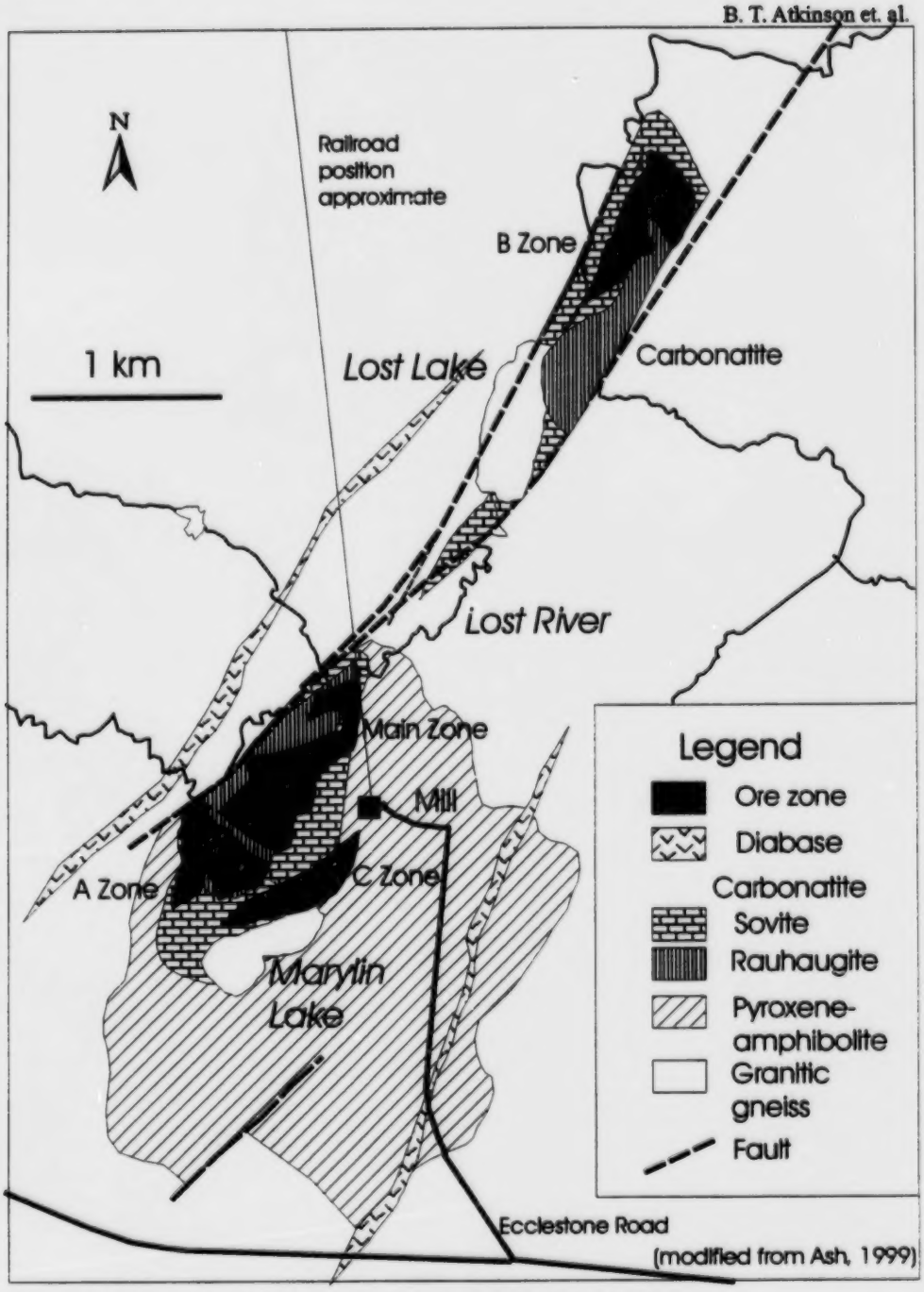


Figure 4. Geology of the Agrium Inc. - Kapuskasing Phosphate Operations.

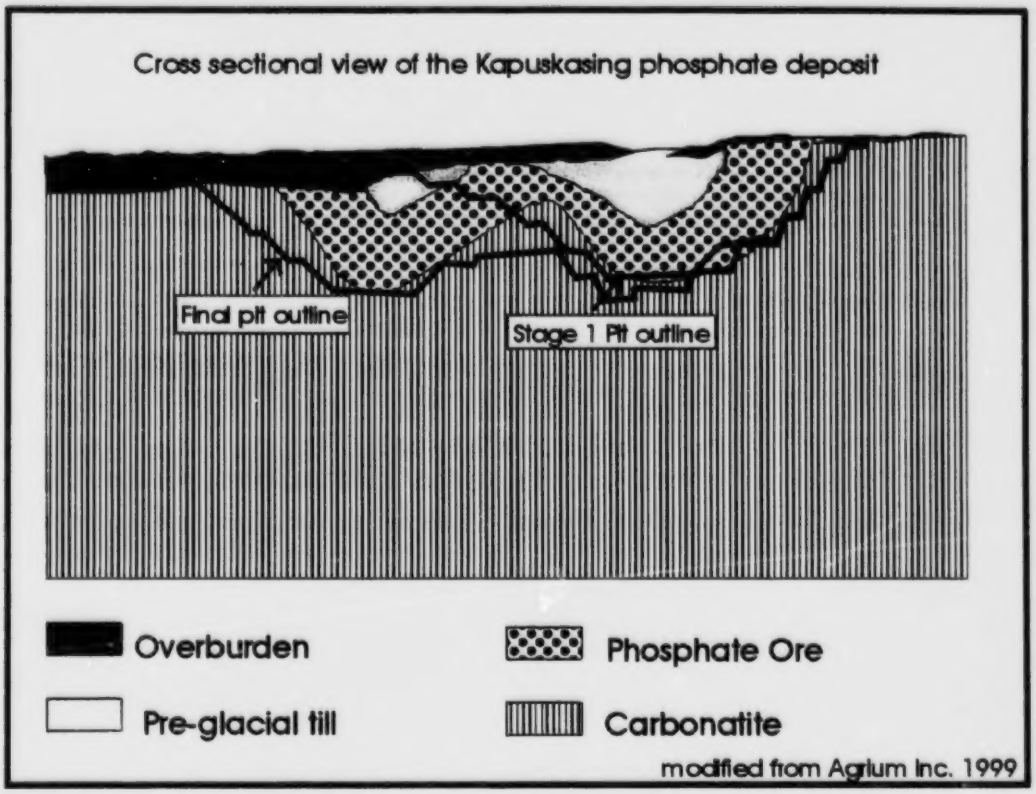


Figure 5. Cross-sectional view of Agrium Inc. - Kapuskasing Phosphate Operations.

Great White Minerals Ltd.

Great White Minerals produced quartz material from their Fripp Township quarry for silica feedstock and aggregate for local and US markets. The quarry operated throughout the year.

Luzenac Inc. — Penhorwood Mine

Located in Penhorwood Township, 80 km west of Timmins, the Penhorwood mine operated throughout the year as an open pit operation. Talc concentrate from the mine was shipped to Luzenac Inc.'s processing and microgrinding facilities in Timmins. For the year, 162 479 tons of ore were mined to produce 50 808 tons of talc. The operations employ 50 people. K. Tyler is the Manager of Mining.

Roseval Silica Quarry

The Roseval Silica Quarry, located in Penhorwood Township, produced metallurgical grade silica for local markets.

ADVANCED EXPLORATION

Active advanced exploration projects are described below and their locations are shown in Figure 2f.

Shaw Township Silica Quarry

Timmins Prospectors J. Croxall and E. Vuksanovich acquired a group of unpatented mining claims in central Shaw Township that cover a 20 m wide band of chert ironstone. The chert has a crumbling saccrasoidal texture that is being tested for various silica products. During the year, new road access to the site was constructed and several bedrock outcrops were excavated to provide test material. Test pits were blasted several metres in depth to reveal the depth potential of the deposit. A property visit made to the site is described in *Property Examinations*, Croxall - Vuksanovich Property.

St. Andrew Goldfields Ltd. - Stock Mine

The Stock Mine is the site of ongoing underground exploration by St Andrew Goldfields Ltd. and the recently expanded 1000 ton per day on-site mill is operated as a custom gold mill by the company. St. Andrew began open pit mining operations at the Hislop Mine in the Kirkland Lake District. Ore from that operation is transported to the Stock mill for processing.

The Stock Mine has reserves of 453 000 tons grading 0.17 ounce gold per ton, including 106 000 tons of proven and probable reserves with a grade of 0.19 ounce gold per ton. Between 1989 and 1994 the mine produced 119 000 ounces of gold from 758 000 tons of ore with an average grade of 0.184 ounce per ton gold.

Underground development includes an existing 900 foot deep shaft and a production ramp to 1100 feet below surface.

During the year, St. Andrew Goldfields Ltd. and Holmer Gold Inc. announced a joint venture effort to develop the Holmer gold deposit in Bristol Township whereby ore from that property would be milled at the Stock Mine.

Table 3. Assessment files received in the Timmins District in 1999.

Abbreviations

AEM	Airborne electromagnetic survey	HM	Heavy mineral sampling
AM	Airborne magnetic survey	IM	Industrial mineral testing and marketing
AVLF	Airborne very low frequency electromagnetic survey	IP	Induced polarization survey
Beep	Beep Mat Survey	Lc	Linecutting
BH	Bore hole	Met	Metallurgical testing
Bulk	Bulk sampling	OP	Ontario Prospectors Assistance Program
DD	Diamond drilling	PEM	Pulse electromagnetic survey
DGC	Down-hole geochemistry	Pr	Prospecting
DGP	Down-hole geophysics	RES	Resistivity survey
ELO	Exploratory Licence of Occupation	Samp	Sampling (other than bulk)
GC	Geochemical survey	Seismic	Seismic survey
GEM	Ground electromagnetic survey	Str	Stripping
GL	Geological survey	TEM	Transient electromagnetic survey
GM	Ground magnetic survey	Tr	Trenching
Grav	Gravity survey	VLEM	Vertical loop electromagnetic survey
HLEM	Horizontal loop electromagnetic survey	VLFEM	Very low frequency electromagnetic survey

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Adams	Outokumpu Mines Inc.	1996	AEM, AM	2.19361	T-4160

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Alcona et al. (9 townships)	Canadian Pacific Railway Co.	1959	GL	Donation	T-4298
Arbutus	Gagne, M.Y.	1998	Assays, GL, GM, HLEM, Lc	2.19544	T-4213
Arbutus	Gagne, M.Y.	1997	DD - 3 - 524ft, Tr	2.19329	T-4246
Auden	Algoma Steel Corporation, Limited	1967	Assays, GL	Donation	T-4268
BMA 513-812	Consumers Gas Company	1972	DGP, DH - 1 - 853ft	Donation	T-4249
BMA 513-812	Consumers Gas Company	1972	DGP, DH - 1 - 948ft	Donation	T-4249
BMA 526-834	Monopros Limited	1998	GM	2.19229	T-4129
BMA 526-834	Monopros Limited	1998-99	GM, Lc	2.19829	T-4282
BMA 526-834	Monopros Limited	1998-99	GM, Lc	2.19815	T-4290
BMA 527-833	Monopros Limited	1998-99	GM, Lc	2.19821	T-4291
BMA 527-834	Monopros Limited	1998-99	GM, Lc	2.19822	T-4280
BMA 527-834, BMA 528-834	Monopros Limited	1998-99	GM, Lc	2.19823	T-4281
BMA 528-834	Monopros Limited	1998-99	GM, Lc	2.19828	T-4292
BMA 567-884	Aquitaine Company of Canada Ltd.	1969-70	DGP, DH - 1 - 3393ft	Donation	T-4254
Bond	Golden Knight Resources Inc.	1998	GC, Petrography	2.19365	T-4208
Bond, Sheraton	Golden Knight Resources Inc.	1997-98	GM, HLEM, IP, Lc	2.19367	T-4159
Brebeuf	Laporte, C.G.	1998	Str, Tr	2.19620	T-4238
Bristol	Prospectors Alliance Corp.	1998	Assays, DD - 2 - 416m	2.19025	T-4090
Bristol	Allerston, R.E.	1998	DD - 1 - 102m	2.19555	T-4215
Bristol	Allerston, R.E.	1997	IP	2.19330	T-4223
Bristol, Godfrey	Prospectors Alliance Corp.	1998	AEM, AM	2.19440	T-4230
Bristol, Godfrey	Falconbridge Limited	1999	GM, HLEM, Lc	2.19810	T-4278
Burrell, Mulloy, Rowlandson, Shuel	Fatima Mining Company Limited	1957-61	GM, HLEM, Lc, VLEM	Donation	T-4273
Carman	Outokumpu Mines Inc.	1998-99	LPTEM	2.19355	T-4222
Carman et al. (6 townships)	Filo, J.K.	1992	Assays, DD - 2 - 245ft, GL, HLEM, Pr, Samp, Str, VLFEM	OP92-27	T-4200
Carman, Langmuir	M.K.Gold Prospect	1987	Report	Donation	T-2974
Carnegie	Falconbridge Limited	1998	Assays, DD - 2 - 493m	2.19087	T-4105
Carnegie	Falconbridge Limited	1999	GM, HLEM, Lc	2.19571	T-4212
Carscallen	Falconbridge Limited	1997	DD - 1 - 99m	2.19300	T-4135
Carscallen	Falconbridge Limited	1998	Assays, DD - 2 - 296m	2.19298	T-4156
Carscallen	Falconbridge Limited	1999	Assays, DD - 2 - 252m	2.19299	T-4157

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Carscallen	Explorers Alliance Corporation	1999	DD - 4 - 454m	2.19813	T-4289
Carscallen	Explorers Alliance Corporation	1999	DD - 1 - 228m	2.19892	T-4307
Casselman, Fenton, Slack, Staples	Berland Resources Ltd.	1998	HLEM, Lc	2.19333	T-4153
Casselman, Fenton, Slack, Staples	Berland Resources Ltd.	1998	Assays, HM, Pr, Samp	2.19334	T-4269
Chester	Young-Shannon Gold Mines, Limited	1999	Str, Tr	2.19553	T-4243
Clergue	Pentland Firth Ventures Ltd.	1999	GM, Lc, VLFEM	2.19509	T-4199
Clergue, Taylor, Walker	Pentland Firth Ventures Ltd.	1999	GM, Lc, VLFEM	2.19485	T-4245
Coderre	Algoma Steel Corporation, Limited	1962	Pr	Donation	T-4272
Cody	Royal Oak Mines Inc.	1998	Assays, DD - 18 - 7054ft	2.19356	T-4165
Cody, Macklem	Pamour Exploration	1973-74	DD - 11 - 7596ft, GL	Donation	T-4089
Crockett et al. (11 townships)	Canadian Pacific Railway Co.	1959	GL	Donation	T-4300
Cumming	Leo Alarie and Sons Limited	1998	Bulk	2.19212	T-4138
Deloro	Royal Oak Mines Inc.	1998	Recutting claim lines	2.19097	T-4112
Deloro	Royal Oak Mines Inc.	1999	DD - 2 - 151m	2.19891	T-4306
Denton	Bonhomme, J.-C.	1997	Assays, DD - 4 - 511m	2.19301	T-4136
Denton	Bonhomme, J.-C.	1999	GM, IP, Lc	2.19543	T-4220
Denyes	Patrie, D.F.	1997	IP, Lc	2.17759	T-4177
Denyes, Raney, Rollo, Swayze	Algoma Steel Corporation,	1960	GL	Donation	T-4271
Doherty, Pelletier	Jean M, Jean Y	1991-92	Assays, DD - 3 - 574m, GL, Samp, Tr	Donation	T-4083
Dore	Mortimer, C.H.	1998	DD - 1 - 63ft, Str, Tr	2.19522	T-4229
Dore, Heenan	Archibald, G.M.	1997	GL, Pr, Samp	OP97-19	T-4202
Dundonald, Evelyn	Kinross Gold Corporation	1999	GM, IP, Lc	2.19328	T-4152
Ecclestone	Silverman, G.C.	1998-99	Assays, HM	2.19542	T-4244
Emerson, Kipling	Great Lakes Kaolin Inc.	1996	AM, AVLF	2.18961	T-4115
English	G.S.W.Bruce & Associates Inc.	1999	Assays	2.19179	T-4123
English	Tri Origin Exploration Ltd.	1998	Assays, DD - 1 - 150m	2.19231	T-4126
English	Tri Origin Exploration Ltd.	1998	Assays, DD - 1 - 225m	2.19248	T-4140
English, Semple	Tri Origin Exploration Ltd.	1998	DGP	2.19249	T-4146
English, Semple, Zavitz	Tri Origin Exploration Ltd.	1998	Assays, DD - 8 - 1282m	2.19149	T-4148
Fallon	Meunier, D.	1997-98	GM, HLEM, IP, Lc	2.18975	T-4097

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Feagan Lake, Nagagami River, North of Feagan Lake, Pitopiko	Algoma Steel Corporation, Limited	1963-66	AM	Donation	T-4267
Fenton	Dignard, J., Dignard, S.	1997	Assays, Beep, Pr, Samp, Str	OP97-001 & -002	T-4170
Fripp	Quartz Lake Mines Limited	1928	Assays, Samp	Donation	T-4270
Fripp, Price	Argentex Resource Exploration Corp. Ltd.	1981-83	Report	Donation	T-2431
Garnet et al. (5 townships)	Charette, M.	1997	HM, Samp, Seismic	OP97-21	T-4193
Geikie	Grant, J.C.	1998	GL, GM, VLFEM	2.19181	T-4125
German	St. Andrew Goldfields Ltd.	1999	GC	2.19727	T-4259
Godfrey, Jamieson	Moneta Porcupine Mines Inc.	1999	DD - 4 - 828m, DGP, GC, IP, TEM	2.19366	T-4240
Gowan	Falconbridge Limited	1999	Assays, DD - 1 - 166m	2.19360	T-4167
Greenlaw, Halcrow, Tooms	Regal Petroleum Ltd.	1985-86	Report	Donation	T-2878
Halcrow	Alcanex Ltd.	1997	IP, RES	2.18794	T-4108
Halliday	Pegg, C.C.	1997	DD - 1 - 221m	2.19480	T-4241
Halliday et al.	Pegg, C.C.	1997-98	DD - 1 - 188ft	2.19481	T-4242
Halsey	Algoma Ore Properties, Limited	1939	Pr	Donation	T-4287
Hambly	Aquitaine Company of Canada	1973	DGP, DH - 1 - 1729ft	Donation	T-4253
Hanna, Reaume	Queenston Mining Inc.	1999	GM, HLEM	2.19614	T-4239
Heenan	MacDonnell, A.	1999	Assays, Str, Tr	2.19636	T-4260
Heenan	Algoma Steel Corporation,	1967	GL, GM	Donation	T-4276
Heenan	Algoma Ore Properties, Limited	1939	Assays, GL	Donation	T-4275
Heenan, Marion	Leith, C.K.	1907-09	Assays, GL, Pr	Donation	T-4274
Hobson, Hogg	Falconbridge Limited	1997-98	DD - 18 - 2881m	2.19347	T-4158
Horwood	Ross, F.J.	1997	Assays, Samp, Str, Tr	OP97-07	T-4171
Horwood	Robert, J.	1997	Assays, Pr, Samp	OP97-31	T-4174
Horwood	Ross, F.J.	1998-99	Assays, Pr, Samp, Str	2.19346	T-4204
Horwood	Ross, F.J.	1997	Assays, Bulk, Pr, Str	2.19345	T-4226
Hoyle	Pentland Firth Ventures Ltd.	1998	Assays, DD - 3 - 462m	2.19572	T-4258
Hoyle	Moneta Porcupine Mines Inc.	1999	Assays, GC	2.19830	T-4283
Hudson Bay	Aquitaine Company of Canada	1969	DGC, DGP, DH - 1 - 3926ft	Donation	T-4252
Hudson Bay	Aquitaine Company of Canada	1969-70	DH - 1 - 1446ft	Donation	T-4254

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Huffman	Tonopah Resources Inc.	1980-86	Report	Donation	T-2838
Hutt, Semple	Triex Resources Ltd.	1998	Assays, GL	2.19037	T-4095
Hutt, Semple	Triex Resources Ltd.	1998	GM, VLFEM	2.19101	T-4121
Hutt, Semple, Zavitz	Tremblay, M.A.	1997	GM, Lc, Pr, Samp, VLFEM	OP97-12	T-4201
Ivanhoe	Morin, R.J.	1998	Assays, Str	2.19744	T-4266
Jamieson	Moneta Porcupine Mines Inc.	1998	Lc, TEM	2.19039	T-4096
Jamieson	Falconbridge Limited	1999	GM, HLEM, Lc	2.19472	T-4184
Jamieson, Robb	Falconbridge Limited	1997	DGP, IP	ELO 14924	T-4104
Jessop	Falconbridge Limited	1998	Assays, DD - 5 - 1222m	2.19084	T-4103
Jessop	Meunier, D.	1998-99	Assays, DD - 4 - 557m	2.19253	T-4141
Jessop	Explorers Alliance Corporation	1998	Assays, DD - 5 - 1223m	2.19362	T-4168
Keith	Robert, J.	1998	Assays, GC	2.19089	T-4107
Keith	Marshall Minerals Corp.	1998	Assays, DD - 7 - 1043m	2.19209	T-4137
Keith	Algoma Ore Properties, Limited	1958-61	GL	Donation	T-4285
Keith	The Algoma Central and Hudson Bay Railway Co.	1909-29	GL, Met, Samp	Donation	T-4286
Kenogaming	Eastmain Resources Inc.	1996-97	Assays, DD - 13 - 2696m	2.19144	T-4147
Kenogaming	Salo, J.-A.G.	1997	Assays, DD - 1 - 394ft, GM, Lc, Pr	OP97-32	T-4175
Kenogaming, Penhorwood, Reeves	Battle Mountain Canada Ltd.	1999	Assays, DD - 9 - 2486m	2.19622	T-4234
Kilmer, Valentine	McKinnon, D.	1999	GM, VLFEM	2.19809	T-4277
Kingroy Lake	Perron, A.H.	1986-87	AM, AVLF	2.9697	T-4117
Lackner	Salo, L.J.	1998-99	Assays, DD - 1 - 306ft	2.19357	T-4166
Lackner, McNaught	Algoma Steel Corporation,	1951-74	Assays, DD - 1 - 627ft, Pr	Donation	T-4288
Langmuir	Luhta, L.E.	1999	GL, GM, HLEM, IP, Lc	2.19564	T-4214
Langmuir	Salo, R.W.	1999	GM, Recutting lines	2.19563	T-4218
Little	Gamble, A.P.D.	1999	IP, Lc	2.19866	T-4303
Little, Tully	Grant, J.C.	1997	GM, VLFEM	2.19241/ OP97-67, 8	T-4132
Loveland	Meunier, D.	1999	Str, Tr	2.19096	T-4111
Loveland	Meunier, D.	1997	Assays, DD - 4 - 1124m	2.18939	T-4113
Loveland	Meunier, D.	1998	Assays, DD - 4 - 835m	2.19234	T-4143
Loveland	Meunier, D.	1999	DD - 1 - 257m	2.19512	T-4198

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Macdiarmid	Falconbridge Limited	1998	GM, HLEM, Lc	2.19006	T-4085
Macdiarmid	Falconbridge Limited	1998	GM, HLEM, Lc	2.19007	T-4086
Macdiarmid	Falconbridge Limited	1998	Assays, DD - 4 - 1001m	2.19483	T-4191
Macdiarmid	Hollinger Mines Ltd	1966	GM, HLEM	Donation	T-4261
Macdiarmid	Aur Resources Inc.	1999	AEM, AM	2.19874	T-4295
Mallard	Anderson, S.D.	1999	Assays, Pr, VLFEM	2.19348	T-4231
Mann	Falconbridge Limited	1997	HLEM, Lc	2.18969	T-4081
Mann	Falconbridge Limited	1998	Assays, DD - 4 - 615m	2.18970	T-4082
Mann	Falconbridge Limited	1998	GM, HLEM, Lc	2.18967	T-4084
Mann	Ward, D.A., Ward, J.T.	1997	Assays, DD - 3 - 180m, GM, Grav, IP, Lc	OP97-291 & -292	T-4173
Mann	Falconbridge Limited	1998	GC, GL, Samp	2.19072	T-4178
Mann	Hill, L.E.	1998	Assays, GL, GM, HLEM, Lc, Pr	2.19475	T-4186
Mann	Falconbridge Limited	1999	IP, Lc	2.19593	T-4224
Mann	Falconbridge Limited	1999	GM, HLEM, Lc	2.19875	T-4297
Massey	Boissonesult, J.R.	1998	GC, GL, GM, HLEM, IP, Lc, Samp, Str, VLFEM	2.19255	T-4176
McBrien	Algoma Central Railway	1969	Assays, DD - 23 - 3884ft, IM	Donation	T-4248
McCart	Gamble, A.P.D.	1998	GM, HLEM, Lc	2.19476	T-4187
McCart	Gamble, S.A.	1999	Assays, DD - 1 - 200m	2.19865	T-4293
Minnipuka	Algoma Ore Properties, Limited	1959	GM, GL	Donation	T-4299
Moberly, Thorburn	Lalonde, D.J.	1999	GM, IP, Lc	2.19889	T-4305
Mountjoy	Comstate Resources Ltd.	1998	GM, IP, Lc	2.19030	T-4093
Mountjoy	Comaplex Minerals Corp.	1999	GM, IP, Lc	2.19742	T-4262
Mountjoy	Comaplex Minerals Corp.	1999	GM, Lc	2.19757	T-4264
Murphy	Falconbridge Limited	1997-98	Assays, DD - 1 - 216m	2.19609	T-4232
Murphy, Wark	1232448 Ontario Inc.	1998	DD - 1 - 200m	2.19008	T-4087
Murphy, Wark	Falconbridge Limited	1998-99	GM, HLEM, Lc	2.19178	T-4122
Muskego	Ladouceur, J.D.	1998	Assays	2.19359	T-4207
Nesbitt	Pyke, D.R.	1999	IP, Lc	2.19349	T-4155
North of Fox River	Gibson, D.L.	1997	GM, HM	OP97-216 & -330	T-4172
Ogden	East West Resource Corporation	1998	Assays, DD - 7 - 1982m	2.19235	T-4130
Ogden	Anderson, S.D.	1998	IP	2.19230	T-4139
Ogden	Echo Bay Mines Ltd.	1997-98	GM, Lc	2.19443	T-4181

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Ogden	Echo Bay Mines Ltd.	1999	Assays, DD - 4 - 890m	2.19547	T-4217
Ogden	Echo Bay Mines Ltd.	1999	Assays, DD - 5 - 1404m	2.19756	T-4263
Ogden, Price	Inmet Mining Corporation	1998	Assays, DD - 4 - 894m	2.19005	T-4088
Osway	Durham, B.	1998	Assays, GL, GM, HM, IP, Lc, Pr, Samp	2.19484	T-4256
Penhorwood	La société de gestion Maskours	1999	Assays	2.19621	T-4237
Penhorwood	Algoma Steel Corporation,	1960-79	DD - 57 - 3121ft	Donation	T-4301
Penhorwood	Kukatush Mining Corporation (1960) Ltd.	1964-65	Bulk, Met	Donation	T-4309
Penhorwood, Reeves	Battle Mountain Canada Ltd.	1996-98	GM, IP, Lc	2.19038	T-4099
Pitopiko River	Mariner Mines Limited	1970-71	DH - 1 - 4582ft	Donation	T-4250
Prosser	Falconbridge Limited	1997	Assays, DD - 1 - 422m, GC	2.19041	T-4100
Prosser, Wark	Pentland Firth Ventures Ltd.	1998-99	IP	2.19228	T-4142
Reeves	Cross Lake Minerals Ltd.	1998	IP	2.19044	T-4102
Reeves	Edwards, T.H.	1998	Pr, Recutting claim lines, Str, Tr	2.18974	T-4131
Reeves	East West Resource Corporation	1997-98	IP, Lc	2.19073	T-4161
Reid	Falconbridge Limited	1998-99	Assays, DD - 8 - 1836m	2.19500	T-4205
Reid	Falconbridge Limited	1998-99	GM, HLEM, Lc, TEM	2.19870	T-4294
Robb	Falconbridge Limited	1998	DD - 3 - 756m	2.19028	T-4092
Robb	Prospectors Alliance Corp.	1998	Assays, DD - 5 - 734m	2.19565	T-4216
Robb	Kerr, G.	1999	GL	2.19617	T-4236
Sandbank Lake	Aquitaine Company of Canada	1971	DH - 1 - 485ft	Donation	T-4251
Sandbank Lake	Aquitaine Company of Canada	1971	DH - 1 - 1945ft	Donation	T-4251
Semple	Triex Resources Ltd.	1998	IP	2.19027	T-4091
Semple	Triex Resources Ltd.	1998	Assays, DD - 8 - 861m	2.19036	T-4094
Semple	Tri Origin Exploration Ltd.	1998	Assays, DD - 1 - 150m	2.19035	T-4098
Sewell	Cross Lake Minerals Ltd.	1998	Assays, DD - 5 - 1522m	2.19092	T-4109
Shaw	Leo Alarie and Sons Limited	1999	GL, GM, Lc	2.19608	T-4233
Shaw	Croxall, J.E.	1998	Assays, Samp	2.19649	T-4247
Sheraton	Bitton, S.C.	1999	GM, Lc, VLFEM	2.19150	T-4149
Sheraton	Golden Knight Resources Inc.	1998	DGP, PEM	2.19364	T-4179
Sheraton	Goldhunter Explorations Inc.	1998-99	GM, Lc, VLFEM	2.19254	T-4180
Sheraton	Cross Lake Minerals Ltd.	1998	Assays, DD - 14 - 6842m	2.19468	T-4195
Sheraton	Golden Knight Resources Inc.	1998	Mise a la masse	2.19379	T-4209

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Sheraton	Golden Knight Resources Inc.	1997-98	Assays, DD - 16 - 5256m	2.19447	T-4228
Sheraton, Thomas	Maple Minerals Inc.	1997-98	GM, IP, Lc	2.18926	T-4119
Silk	Campsall, C.R.	1998	Samp, Str, Tr	2.19026	T-4116
Sothman	Keast, T.M.	1998	Assays, GC, GL, GM, HLEM, Lc, Pr, Samp	2.19180	T-4197
Sothman	Jones, D.V.	1999	Assays, DD - 2 - 300m, IP, Lc	2.19893	T-4308
South of Ridge Lake	MCK Mining Corp.	1998	AM	2.19295	T-4134
South of Ridge Lake	MCK Mining Corp.	1999	DD - 6 - 770m	2.19358	T-4257
Stock	St. Andrew Goldfields Ltd.	1998	Assays, DD - 1 - 653m	2.19469	T-4182
Stock	St. Andrew Goldfields Ltd.	1998	Assays, DD - 1 - 593m	2.19470	T-4183
Stock	St. Andrew Goldfields Ltd.	1998	Assays, DD - 1 - 831m	2.19477	T-4188
Stock	St. Andrew Goldfields Ltd.	1998	Assays, DD - 1 - 698m	2.19478	T-4189
Stock	St. Andrew Goldfields Ltd.	1998	Assays, DD - 1 - 602m	2.19471	T-4192
Swayze	929357 Ontario Inc.	1998	Assays, GL, Samp	2.18942	T-4114
Thomas	Brownstone Resources Inc.	1999	GM, IP, Lc	2.19363	T-4169
Thomas	Patrie, D.F.	1999	GM, IP, Lc	2.19507	T-4206
Thorburn	Raine, B.N.	1998-99	GM, HLEM, IP, Lc	2.19297	T-4150
Timmins	DRC Resources Corporation	1998	Assays, DD - 4 - 291m, GL	2.19029	T-4128
Timmins	East West Resource Corporation	1998	DD - 5 - 937m, GL, GM, IP, Lc	2.19233	T-4164
Timmins	East West Resource Corporation	1999	Assays, DD - 4 - 624m	2.19562	T-4210
Tisdale	Moneta Porcupine Mines Inc.	1998	Assays, DD - 1 - 350m	2.19042	T-4101
Tisdale	Pyke, D.R.	1994	IP	2.19095	T-4110
Tisdale	Pyke, D.R.	1998	IP, Lc	2.19099	T-4120
Tisdale	Moneta Porcupine Mines Inc.	1997	Assays, GC, GM, Lc	2.19040	T-4133
Tisdale	Placer Dome (CLA) Limited	1997	Assays, DD - 9 - 3053ft	2.19080	T-4162
Tisdale	Mullen, D.V.	1997-98	GM, IP, Lc, VLFEM	OP97-19	T-4194
Tisdale	Placer Dome (CLA) Limited	1998	Assays, DD - 5 - 4443ft	2.19098	T-4196
Tisdale	Mullen, D.V.	1997	GM, Lc, VLFEM	2.19599	T-4225
Tooms	Kirkwood, E.J.	1999	Assays, DD - 3 - 792m	2.19473	T-4185
Tully	Pentland Firth Ventures Ltd.	1999	GM, Lc	2.19335	T-4154
Tully	Kinross Gold Corporation	1997-98	IP	2.19549	T-4211
Tully	Kinross Gold Corporation	1999	GM, Lc	2.19546	T-4219
Tully	Pentland Firth Ventures Ltd.	1997	GM, Lc	2.19296	T-4227
Tully, Wark	Pentland Firth Ventures Ltd.	1998-99	GM, Lc	2.19327	T-4151

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Turnbull	Anderson, S.D.	1998	Assays, Str, Tr	2.19088	T-4106
Turnbull	Rousseau, A.M.	1998	Assays, DD - 3 - 156m	2.19482	T-4190
Turnbull	Filo, J.K.	1998	Assays, Pr, VLFEM	2.19548	T-4221
Turnbull	Falconbridge Limited	1999	GM, HLEM, Lc	2.19820	T-4279
Wark	Falconbridge Limited	1998	DD - 1 - 188m, GM, HLEM, Lc	2.19100	T-4118
Wark	Meunier, D.	1999	Str	2.19673	T-4255
West of Sunday Lake	Franco-Nevada Mining Corporation Limited	1997	Assays, DD - 3 - 3739m	2.19093	T-4127
West of Sunday Lake	Franco-Nevada Mining Corporation Limited	1996-97	Assays, DD - 4 - 3711m	2.19093	T-4127
Whalen, Wigle	Redore Mining Company Ltd.	1938-39	Samp, Str, Tr	Donation	T-4284
Whitney	Royal Oak Mines Inc.	1997	Assays, DD - 1 - 308ft	2.19143	T-4124
Whitney	Anderson, S.D.	1999	IP, Recutting lines	2.19246	T-4144
Whitney	Royal Oak Mines Inc.	1998	Assays, DD - 1 - 1359ft	2.19247	T-4145
Whitney	Caron, D.D.	1999	Assays, Pr, Samp	2.19245	T-4203
Whitney	Robert, J.	1999	GM, VLFEM	2.19619	T-4235
Whitney	Noranda Mining & Exploration	1998	Assays, DD - 1 - 169m	Donation	T-4265
Whitney	Crites, J.G.	1999	Lc, VLFEM	2.19872	T-4296
Whitney	Noranda Mining & Exploration	1999	TEM	2.19888	T-4304
Yeo	Duess, R.L.	1999	Assays, GL, Pr, Samp	2.19743	T-4302
Zavitz	Claim Lake Resources Inc.	1998-99	Tr	2.19227	T-4163

EXPLORATION ACTIVITY

There were 13 major companies, 20 junior companies and numerous individuals exploring 87 separate projects in the Timmins Regional Resident Geologist district. A summary of activities reported in 1999 is presented in Table 4. Highlights of selected exploration programs are described below.

Canabrava Diamond Corporation - Paramount Ventures and Finance Inc. - KAP Project

Canabrava Diamond Corporation and Paramount Ventures and Finance Inc. joint ventured with Kennecott Canada Exploration Inc. to explore the companies Ontario projects. The Kap project is jointly held by Canabrava and Paramount Ventures and Finance. Under the agreement, Kennecott can earn a 60% interest in the Ontario joint venture. The Kap Project includes three property blocks covering 120 000 hectares along the Kapuskasing Structural Zone. Airborne geophysical surveys and geochemical sampling programs have been completed over the properties.

Cross Lake Minerals Ltd. – Sheraton -Timmins Property

Cross Lake Minerals continued to explore for base metals on the 312 claim group in Sheraton and Timmins townships where copper and zinc mineralization was discovered in 1997. The company completed 10 NQ (size) diamond drill holes totalling 3970 m on the Cross Lake Zone. Assaying, petrographic studies, geochemical analysis and metallurgical testing of the drill core was completed. Limited surface and down-hole pulse electromagnetic surveys were carried out. To date, the company has completed 28 458 m of diamond drilling in 76 holes on the property.

Falconbridge Limited - Timmins West Properties

A three way joint venture exploration program between Falconbridge Limited, Hudson Bay Exploration and Development Ltd. and Explorers Alliance Corporation culminated in several diamond drilling projects totalling 4623 m in 19 holes. Drilling was completed in Reid, MacDiarmid, Mahaffey and Jessop townships.

Holmer Gold Mines Ltd. - Bristol Township Property

Holmer Gold has outlined a gold resource of 2.14 million tons grading 0.23 ounce per ton gold on their Bristol Township property. The resource estimate is based on 68 diamond drill holes on 25 to 50 m spacings, using a cut off grade of 3 gm over a minimum width of 1 m. A new zone of shallow gold mineralization to a depth of 100 m has been identified. A gold resource of 720 000 tonnes with a grade of 2.57 g/t has been outlined by 36 diamond drill holes spaced at 25 m centres. The cut off grade used for the shallow gold mineralization was 0.5 g/t gold. (Holmer Gold Mines Ltd., *press release*, February 2, 1999). Holmer Gold has formed a joint venture with St. Andrew Gold Fields Limited whereby St Andrew can earn a 40% profit interest in the upper 100 m of the deposit by completing a feasibility study on the deposit and by paying development costs. (*The Northern Miner*, January 17, 2000).

International Canalaska Resources Ltd. - Dougherty Lake

International Canalaska Resources Ltd. has an option on a block of 643 claims in Timmins and Michie townships. In 1999, the company completed 4 NQ diamond drill holes totalling 624 m in Timmins Township. The exploration program was carried out to test the on strike continuity of base metal mineralization encountered in previous diamond drilling on the west side of Dougherty Lake.

Monopros Limited - Attawapiskat Kimberlites

Detailed stream sampling along the Attawapiskat River and its tributaries by Monopros Limited yielded numerous kimberlite indicator minerals. Sampling, combined with aeromagnetic surveys covering 2900 miles^2 resulted in the discovery of the Attawapiskat kimberlite pipe cluster. The kimberlite pipes are located about 100 km west of the community of Attawapiskat and 350 km north of Hearst. Access is by winter road from Attawapiskat on James Bay. Diamond drilling of magnetic anomalies completed in 1989 and 1990 identified 16 kimberlite pipes, 15 were diamondiferous. (Kong, Boucher and Scott Smith, 1998). In 1998, Monopros sampled several of the pipes by diamond drilling for further evaluation. Work included diamond drilling of 15 holes totalling 2600 m. In 1999, more diamond drilling was done, followed by the removal of a 300 ton bulk sample from the Victor pipe for additional testing. Kimberlite material was removed both by large diameter drill coring and by conventional trenching and blasting. A sketch of the Victor kimberlite pipe is depicted in Figure 6.

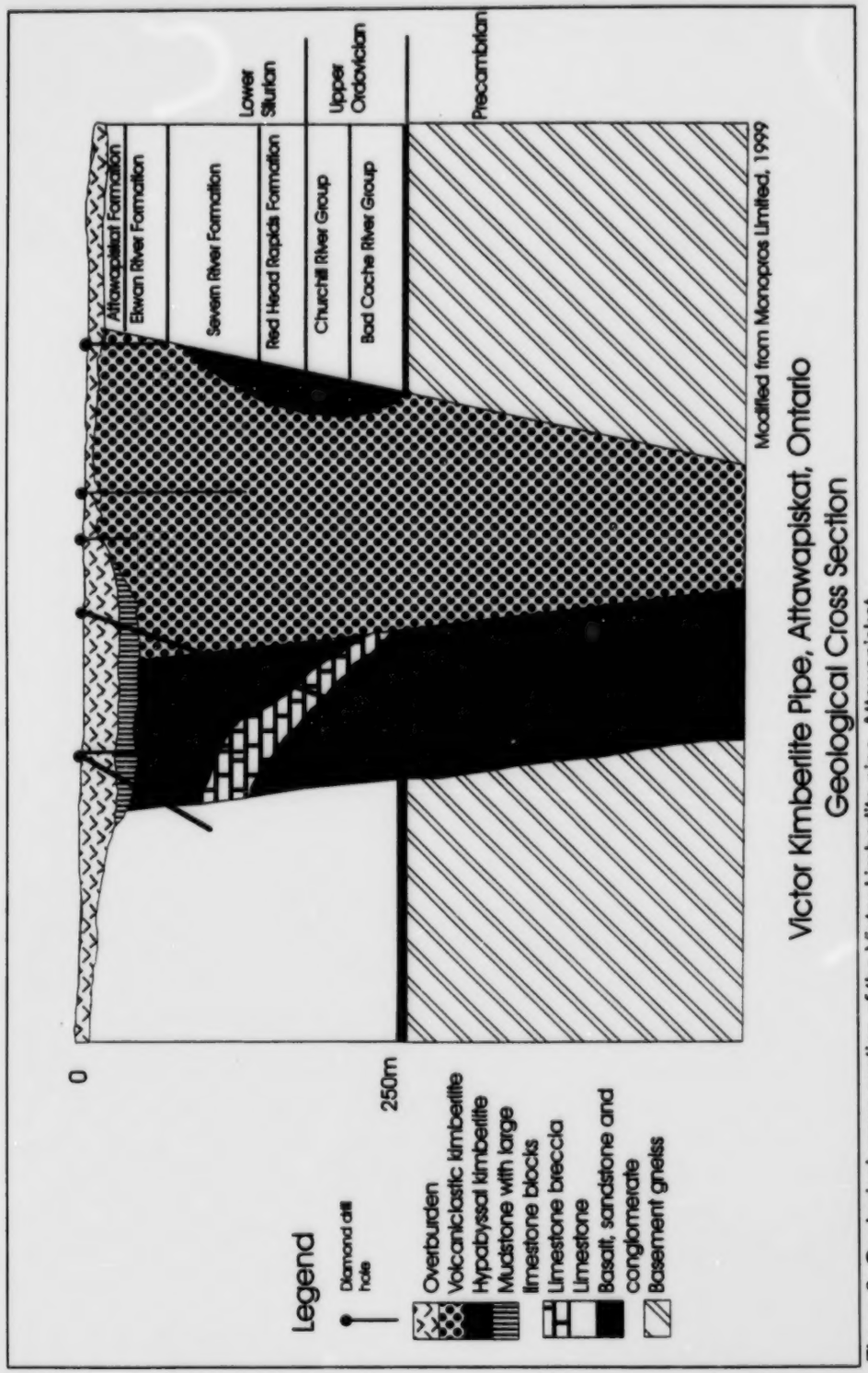


Figure 6. Geological cross section of the Victor kimberlite pipe, Attawapiskat.

Prospectors Alliance Corporation - Timmins West Properties

Prospectors Alliance, Explorers Alliance Corporation and a numbered Ontario company continued with active exploration projects for both gold and base metals in Robb, Godfrey, Carscallen, Denton, Bristol and Arbutus townships. On the properties in these townships, the companies completed diamond drilling of 28 holes totalling 5108 m and geological, geophysical and geochemical surveys.

United Tex-Sol Mines Inc. - Clavos Property

The Clavos property lies on the boundary between Stock and German townships and is held by United Tex-Sol Mines Inc. Under a three year exploration lease, Kinross Gold Corporation is exploring the property with an option to purchase. During the year, a total of 19 102 m of diamond drilling was completed in 68 holes to supplement earlier drilling and to delineate new zones of gold mineralization. Previous drilling indicated the property has a resource of 1.75 million tonnes grading 6.40 grams per ton gold for a total of 360 080 ounces.

Table 4. Exploration activity in the Timmins District in 1999. (Keyed to Figures 2c, 2e, 2f, 3)

Abbreviations

AEM	Airborne electromagnetic survey	Met	Metallurgical testing
AM	Airborne magnetic survey	MMI	Mobile Metal Ion GC survey
Ag	Silver	Ni	Nickel
Au	Gold	OV	Overburden drilling
BM	Base metals	PEM	Pulse electromagnetic survey
Cu	Copper	PGM	Platinum group metals
DD	Diamond drilling	Pr	Prospecting
DGP	Down-hole geophysics	REE	Rare earth elements
GC	Geochemical survey	Samp	Sampling (other than bulk)
GL	Geological Survey	Si	Silica
GM	Ground magnetic survey	Str	Stripping
HLEM	Horizontal loop electromagnetic survey	TEM	Transient electromagnetic survey
JV	Joint Venture	Tr	Trenching
IP	Induced polarization survey	VLFEM	Very low frequency electromagnetic survey
Lc	Linecutting	Zn	Zinc

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
1	Anderson, S.D.	Mallard (Au)	Pr, Samp, Assays, VLFEM
2	Anderson, S.D.	Whitney (Au)	Recutting lines, IP
3	Aur Resources Inc.	Macdiarmid (BM)	AEM, AM
4	Battle Mountain Canada Ltd.	Reeves, Kenogaming, Penhorwood (Au)	DD - 9 - 2486m, Assays
5	Berland Resources	Cargill (diamond, BM)	Airborne survey
6	Bitton, S.C.	Sheraton (BM)	Lc, GM, VLFEM
7	Boissoneault, J.	Massey (BM)	DD - 3
8	Brownstone Resources Inc.	Thomas (Au, BM)	Lc, GM, IP
9	Cameco Gold Inc.	Bristol (Au)	Compilation, Assays, Lc
10	Caron, D.D.	Whitney (Au, BM)	Pr, Samp, Assays
11	Claim Lake Resources Inc.	Zavitz (Au, BM)	Tr

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
12	Comaplex Minerals Corp.	Mountjoy (Au)	Le, GM, IP
13	Comaplex Minerals Corp.	Mountjoy (Au)	Le, GM
14	Crites, J.G.	Whitney (Au)	Le, VLFEM
15	Cross Lake Minerals Ltd.	Sheraton (BM)	Le, GL, PEM, GC, Met, DD - 10 - 3970m, DGP, Assays
16	Croxall, J.	Shaw (Si)	Le, GL, GM, Samp
17	Davidson Tisdale Ltd.	Tisdale(Au)	GL
18	Duess, R.L.	Yeo (Au)	Pr, Samp, Assays, GL
19	Echo Bay Mines Ltd.	Ogden (Au)	Le, GM, IP, DD - 8 - 2294m, Assays
20	Echo Bay Mines Ltd.	Ogden (Au)	DD - 5 - 1404m, Assays
21	Explorers Alliance Corporation	Carscallen (Au, BM)	Le, GM, HLEM, GC, DD - 6 - 934m, Assays, DGP
22	Explorers Alliance Corporation	Robb (Au, BM)	Le, GC, GM, HLEM, IP, DD - 6- 1346m, DGP
23	Falconbridge Limited / Explorers Alliance Corporation / Prospectors Alliance Corporation	Bristol, Godfrey (Au, BM)	Le, GM, HLEM, GC, DD - 4 - 960m, DGP
24	Falconbridge Limited	Carnegie (BM)	Le, GM, HLEM
25	Falconbridge Limited	Gowan (Au, BM)	DD - 1 - 166m, Assays
26	Falconbridge Limited	Jamieson (BM)	Le, GM, HLEM
27	Falconbridge Limited	Mann (BM)	Le, IP
28	Falconbridge Limited	Mann (BM)	Le, GM, HLEM
29	Falconbridge Limited	Murphy, Wark (BM)	Le, GM, HLEM
30	Falconbridge Limited	Turnbull (BM)	Le, GM, HLEM
31	Falconbridge Limited / Hudson Bay Exploration and Development Company Limited / Explorers Alliance Corporation JV	Reid (BM)	Le, GM, HLEM, TEM
32	Falconbridge Limited / Hudson Bay Exploration and Development Company Limited / Explorers Alliance Corporation JV	Reid (Au, BM)	DD - 8 - 1836m, Assays
32	Falconbridge Limited / Hudson Bay Exploration and Development Company Limited / Explorers Alliance Corporation JV	Macdiarmid, Mahaffy, Jessop (Au, BM)	DD - 11 - 2787m
33	G.S.W.Bruce & Associates Inc.	English (Au)	Assays
34	Gamble, S. & D.	Little (BM)	Le, IP
35	Gamble, S.	McCart (Au)	DD - 1 - 200m, Assays
36	Goldhunter Explorations Inc.	Sheraton (BM)	Le, GM, VLFEM
37	Haire, P.	Brower (Au)	Pr, Compilation
38	Inmet Mining Corporation	Hutt (BM)	DD - 5 - 930m
39	International Canalaska Resources Ltd. / East West Resource Corporation	Timmins (Au, BM)	DD - 4 - 624m, Assays
40	Jones, D.V. & Filo, J.K.	Sothman (Au, BM, PGM)	Le, IP, DD - 2 - 300m, Assays
41	Kerr, G.	Robb (Au, Ni)	GL
42	Kinross Gold Corporation	Dundonald, Evelyn (Au)	Le, GM, IP
43	Kinross Gold Corporation	Tully (Au)	Le, GM

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
44	Kirkwood, E.J.	Tooms (Ni)	DD - 3 - 792m, Assays
45	La société de gestion Maskours inc.	Penhorwood (Si)	Assays
46	Lalonde, D.J.	Moberly, Thorburn (BM)	Lc, GM, IP
47	Luhta, L.E.	Langmuir (Ni)	Lc, GL, GM, HLEM, IP
48	MCK Mining Corp.	South of Ridge Lake (phosphate)	DD - 6 - 770m
49	McKinnon, D.	Kilmer, Valentine (kimberlite)	GM, VLFEM
50	Meunier, D.	Jessop (Au)	DD - 4 - 557m, Assays
51	Meunier, D.	Loveland (BM)	Str, Tr, DD - 1 - 257m
52	Meunier, D.	Wark (Au, BM)	Str
53	Moneta Porcupine Mines Inc.	Godfrey (BM)	IP
54	Moneta Porcupine Mines Inc.	Hoyle (Au, Ag, Ni, PGM)	GC (MMI)
55	Moneta Porcupine Mines Inc. / Cameco Gold Inc. J.V.	Tisdale, Deloro (Au)	Lc, Pr, Str, Samp, DD - 9 - 4013m, Assays, GC, IP
56	Monopros Limited	Attawapiskat area (diamond)	OV - 31 - 4704m, Tr, DD - 11 - 2856m, bulk sampling
57	Noranda Mining & Exploration Inc.	Whitney (BM)	TEM, DD
58	Opawica Resources / Falconbridge Limited	Carnegie (BM)	DD - 4 - 400m
59	Opawica Resources / Falconbridge Limited	Kidd (BM)	DD - 6 - 7518m
60	Outokumpu Mines Inc.	Carman (Ni)	TEM, GP Compilation
61	Patrie, D.F.	Thomas (Au, BM)	Lc, GM, IP
62	Pentland Firth Ventures Ltd.	Clergue (Au)	Lc, GM, VLFEM
63	Pentland Firth Ventures Ltd.	Clergue (Au)	DD - 8 - 1644m, GL, Samp
64	Pentland Firth Ventures Ltd. / United Tex-Sol Mines Inc.	German, Stock (Au)	DD - 68 - 19,102m, Lc, GM, IP
65	Pentland Firth Ventures Ltd.	Hoyle (Au)	DD - 8 - 1318m (Wetmore), DD - 7 - 827m (Wettlaufer)
66	Pentland Firth Ventures Ltd.	Prosser, Wark (Au)	IP
67	Pentland Firth Ventures Ltd.	Tully, Wark (Au, BM)	Lc, GM
68	Pinecrest Resources Inc.	Chester (Au)	Lc, Str, GM, IP, DD
69	Placer Dome	Tisdale(Au)	DD - 29 - 16,216ft
70	Prospectors Alliance Corporation	Arbutus (Au, BM)	Lc, GC, GM, HLEM, DD - 3 - 483m
71	Prospectors Alliance Corporation	Bristol (Au, Zn)	Lc, DD - 4 - 729m, GM, HLEM, GC
72	Prospectors Alliance Corporation	Denton (Au, BM)	Lc, GM, HLEM, IP, GC, DD - 5 - 660m, DGP
73	Pyke, D.R.	Nesbitt (BM)	Lc, IP
74	Queenston Mining Inc.	Hanna, Reaume (Cu, Zn)	Lc, GM, HLEM
75	Raine, B.N.	Thorburn (Au)	Lc,GM, HLEM, IP
76	Robert, J.	Whitney (Au)	GM, VLFEM
77	Ross, F.J.	Horwood (Au)	Pr, Samp, Str, Assays
78	Royal Oak Mines Inc.	Deloro (talc)	DD - 2 - 151m
79	Salo, L.J.	Lackner (Ni, REE, phosphate)	DD - 1 - 306ft, Assays
80	Salo, R.W.	Langmuir (Ni)	GM, Recutting lines

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
81	St. Andrew Goldfields Ltd.	Bond (Au)	Le, GM
82	St. Andrew Goldfields Ltd. / Holmer Gold Mines Limited	Bristol (Au)	DD - 10 - 1317m
83	St. Andrew Goldfields Ltd.	German (Au)	GC
84	St. Andrew Goldfields Ltd.	Stock (Au)	DD - 2 - 806m, GC
85	Tremblay, M. & Robert, J.	Hutt (Au, BM)	Pr
86	Valliere, M.	Lennox, Calder (Au)	DD
87	Young-Shannon Gold Mines, Limited	Chester (Au)	Str, Tr, Assays

LAND USE PLANNING ACTIVITY

The Ontario Living Legacy program was implemented to complete the Ontario Provincial Parks system to the end of the 20th century. Resident geologist staff completed mineral resource assessments of candidate parks and protected areas.

Regional Resident Geologist staff provided information on mineral potential to municipalities for their consideration in official town plans and plan amendments. Staff also provided input and consultation to the Ministry of Municipal Affairs and Housing for regional restructuring.

RESIDENT GEOLOGIST PROGRAM STAFF AND ACTIVITIES

In 1999, the Timmins Regional Resident Geologist office was staffed by B. Atkinson, Regional Resident Geologist, A. Wilson and R. Pressacco, District Geologists, and P. Hope, District Support Geologist. A. Wilson maintained a seasonal office in Wawa. In June, R. Pressacco left his position and was replaced by G. Seim in November. As Regional Support Geologist, D. Draper maintained the ERLIS (Earth Resources Land Information System) database. Summer field and office assistance, funded under the Summer Experience Program, was provided by S. Vukelich and S. Thibeault. S. Beauchamp worked as a contract geologist beginning in July and was responsible for updating and verifying the northeast Ontario mineral deposit inventory (MDI) database.

Office statistics are provided in Table 5.

Table 5. Summary of staff activities, Timmins Regional Resident Geologist Office, 1997 - 1999

Activity	1997	1998	1999
Assessment files received (including donations)	225	269	255
Client visits - Office	2406	2706	1884
Client visits - Drill Core Library	238	133	28
ERLIS client sessions (non-staff)	207	187	102
Geological tours given	3	6	7
Geoscience library additions (publications; papers; maps)	91	299	526*
OPAP files received	23	17	19

OPAP grants awarded (Timmins, including Wawa area)	44	36	50
Property visits by staff	8	72	73
Telephone inquiries	4284	3387	2908
MDI records ADDED[1]			161
MDI records REVISED		41	921
MDI records DEEPENED[2]			403
MDI records DELETED			20

* *Figure reflects addition of Wawa District technical papers and theses to Timmins RRGO library*
[1] *Distribution of MDI records added, by area: Swayze—105; Central Michipicoten—34; Central Abitibi—19; James Bay Lowlands—6.*
[2] *Distribution of MDI records deepened, by area: Swayze—265; Central Michipicoten—110; Central Abitibi—19; James Bay Lowlands—9.*

PROPERTY EXAMINATIONS

During the field season, a number of property examinations were made by the staff of the Timmins Regional Resident Geologist Program. Reports on several sites that provide insight into exploration possibilities for the district are described below.

Croxall - Vuksanovich Property, Shaw Township

The Croxall - Vuksanovich property in central Shaw Township is held by Timmins Prospectors J. Croxall and E. Vuksanovich. Several visits to the property were made to examine the geology and to view progress on bulk sample operations. The deposit is being tested for its suitability as a source of silica for use as flux in metallurgical processes as well as other applications where high purity silica is required.

The Croxall - Vuksanovich property is accessed from the Stringer Road that leads south from South Porcupine. An east trending private road turns off the Stringer Road on the north side of the Redstone River and leads to the property. An existing logging trail was reconstructed to permit heavy equipment access to the property. At the outcrop site, two areas have been cleared, stripped and blasted, and a magnetic survey has been completed over the property.

The property consists of 10 unpatented mining claims comprising 24 units in the northeast part of Shaw Township. Claims include: 1228836, 1177843, 1226633, 1226632,1229264, 1229262, 1229265, 1229266, 1227634, 1227635.

Geology

The property is underlain by mafic metavolcanic flows that form part of the Shaw Dome, a major structural feature in the Timmins area. Ultramafic rocks and a north trending diabase dike were observed in outcrops. A prominent band of magnetite ironstone and chert outlines the Shaw Dome and several large ridges of that unit outcrop on the Croxall - Vuksanovich claims. The geology of Shaw Township has been mapped by Carlson (1967).

The first area examined was an outcrop ledge composed of white sugary chert measuring 20 m by 40 m in size. The entire ledge had been blasted to a depth of two metres, exposing more pyritic ironstone within the chert than was visible on weathered surfaces. Components of this outcrop included crumbly, sand-sized rounded granular chert that could be crushed by hand. Patchy orange coloured iron staining discoloured the white chert and may be a surface weathering or diagentic affect. The second outcrop examined was in the

same chert horizon approximately 200 m to the southeast. Individual beds of chert were broken, giving a breccia character to the chert unit. Many of the chert bed clasts were enveloped with pyrite and some beds of magnetite up to 1 cm thick occurred interbedded with the chert. Usually, at the magnetite chert contacts, pyrite was present. The ironstone had the appearance of being partly sulphidized to pyrite, followed by a dissolution of pyrite, resulting in a residual enrichment of the chert. A 4m deep trench had been blasted at the site and several tens of tons of material was stockpiled adjacent to the trench.
Two samples were collected from the property. Sample 99 BTA 42 consists of 1 to 2 cm beds of chert rimmed with medium grained pyrite. Pyrite comprises less than 5% of the rock which is almost entirely fine grained saccrasoidal chert. Sample 99 BTA 43 consists of entirely leached chert which is fine grained and crumbles to the touch. It had a silica content of +92% which is suitable for use as a fluxing agent. Neither sample had any gold value.

Loveland Township Cu - Ni bearing glacial boulders

Numerous large boulders of mafic to ultramafic composition have been discovered in southwestern Loveland Township and are identified on geological maps of the area (Middleton, 1974). A number of exploration projects have attempted to locate the source of these boulders that carry up to 2% combined Cu-Ni as chalcopyrite and pentlandite mineralization. Work by various companies in the up-ice trend of the boulders has been successful in outlining small tonnages of Cu-Ni mineralization. For example, Hollinger Mines Ltd. outlined a copper nickel deposit of 442 000 tons with a grade of 0.42% Cu and 0.71% Ni and Cominco Ltd. identified a similar deposit with a resource of 130 000 tons of mineralization.

Recent work by Timmins Prospector D. Lalonde has been directed towards identifying additional copper nickel mineralization up ice from the Loveland glacial boulders. Ice flow directions, as determined from glacial straie and other glacial features were complex and multi-directional, but present day tills were deposited by southward flowing ice. (Veillette and McClenaghan, 1996, McClenaghan et al, 1998).

Many of the glacial boulders are larger than 1m in diameter and one 3m sized boulder was observed. The boulders have greater than 5% sulphide content and are completely rust stained. Net textured sulphides in the boulders included pyrrhotite and chalcopyrite. Analysis of till from Loveland Township suggests it is locally derived on the basis of the low carbonate content and clast composition. (McClenaghan et al, 1998). D. Lalonde has staked numerous claims over favourable geology in Thorburn, Moberly, Loveland and Byers townships (Figure 7) and completed reconnaissance induced polarization surveys and electromagnetic surveys over parts of the claim groups.

Several samples of the mineralized boulders collected for analysis returned the following results:

Sample Number	Cu	Ni	Au	Pt	Pd
	ppm	ppm	ppb	ppb	ppb
99 BTA 44	1882	5592	94	721	266
99 BTA 46	2026	2109	2	1	1

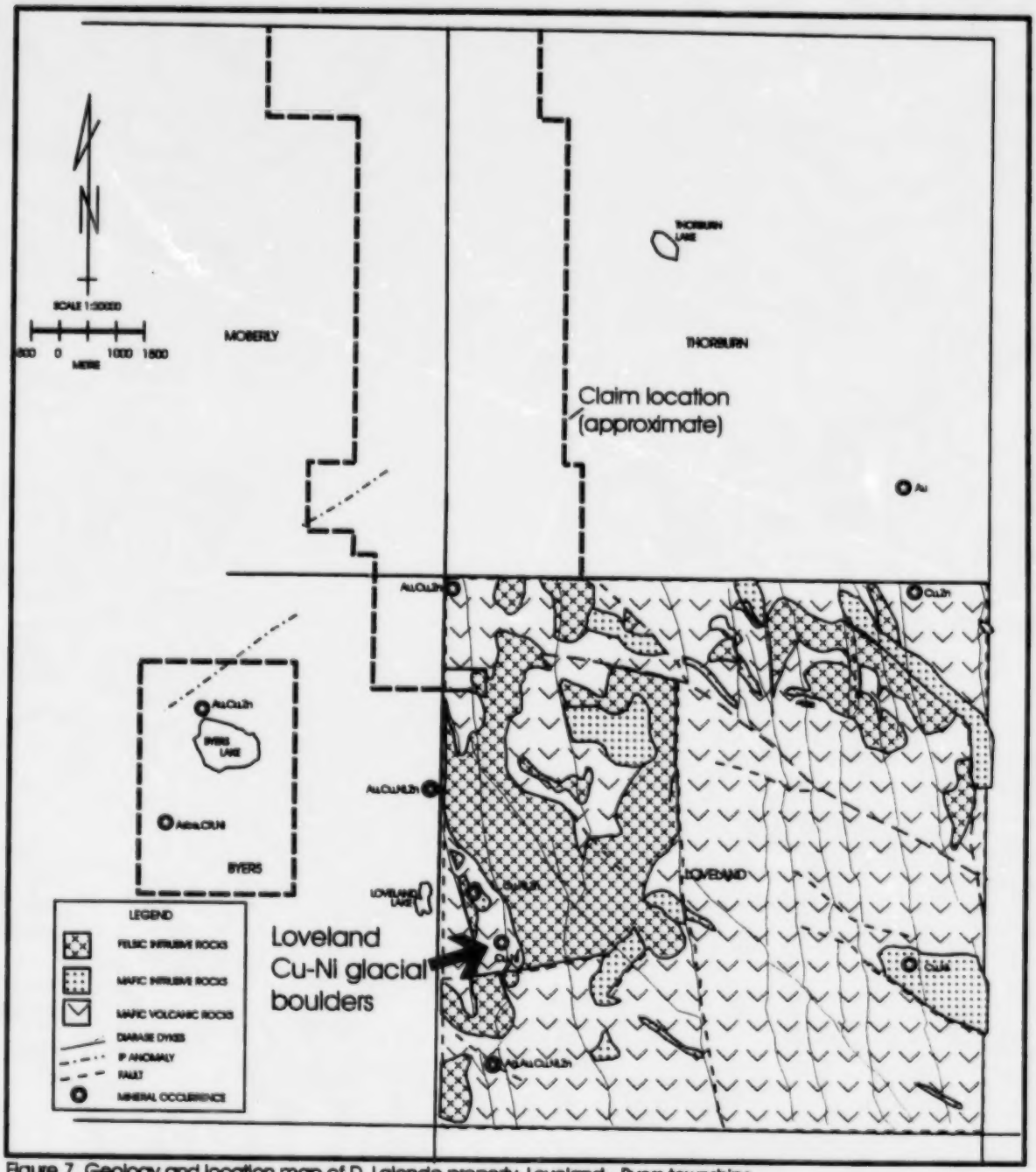


Figure 7. Geology and location map of D. Lalonde property, Loveland - Byers townships.

G. Windsor and F. Ross Property, Horwood Township

Timmins Prospectors G. Windsor and F. Ross completed surface exploration on a group of claims they staked in central Horwood Township. Access to the property is by way of Hwy 101 west from Timmins to the Kenogaming Road, then south on this road to Horwood Lake. Exploration of the property was partly funded under the Ontario Prospectors Assistance Program. Observations from a property examination done on the claims are presented below, and the mineral potential of the area is discussed in the section *Recommendations for Exploration*.

Previous Work

The area has traditionally been explored for gold and numerous small gold occurrences and deposits have been discovered. The Tionaga Mine on the east shore of Horwood Lake produced 2299 ounces of gold from 6653 tons of ore in 1938. The Horwood Lake area has been mapped at a scale of 1:31 680 and is the subject of an Ontario Geological Survey report (Breaks, 1978). Geological compilation of the Swayze greenstone belt included Horwood Township (Ayer, 1995, Heather and Shore, 1999). Mineral deposits have been described by Fumerton and Houle (1993). Horwood Township was covered by a belt-wide airborne geophysical survey by the Ontario Geological Survey (1990). Ultrex Petroleum Limited completed geophysical surveys and drilled 5 holes (531 m) in 1985 for gold. Although no significant gold was encountered in the drilling, drill logs note silicification, carbonate and chlorite alteration and the presence of base metal mineralization. In 1989, Tarzan Gold Ltd. completed a geological survey on a block of 99 unpatented claims in the area. Prospectors J. Patrie, J. Robert and R. Morin completed prospecting and noted widespread sulphide mineralization in the area in 1996.

Field Observations

The location of outcrops observed during the property visit are shown in Figure 8.

Stop 1: Outcrops of mafic pillowed flows are exposed adjacent to a logging trail east of Horwood Lake. The flows are green in colour, amphibolitized and south facing. Pillows and interpillow areas are rusty as a result of pyrrhotite staining. A blasted trench exposes disseminated chalcopyrite and pyrrhotite mineralization with minor sphalerite associated with silicification of the flows on a dip slope of bedrock.. The sulphide content was estimated to be 3%. Individual flows are intruded by narrow feldspar porphyry dikes in the area. To the north of the No 1 trench, a second small bedrock stripping exposes black chlorite alteration of mafic flows and fragmentals. The small outcrop carries pyrite, chalcopyrite and pyrrhotite mineralization. The extent of the alteration and mineralization could not be determined due to overburden cover. At the 3rd blasted pit, additional chalcopyrite mineralization associated with pyrrhotite and pyrite in silicified mafic flows was observed. Centimetre-scale veinlets of a glassy translucent blue mineral (cordierite ?) were noted. Nearby low-lying outcrops of mafic flows are altered with randomly oriented narrow veinlets of albite(?) + zoisite(?) + epidote that comprise 2% to 3% of the rock.

Stop 2: Across the road from stop 1, a large stripped area exposes a quartz vein system that is 2.5 m wide with coarse sulphide mineralization including pyrite, pyrrhotite and chalcopyrite. This occurrence reportedly carries 0.03 to 0.04 ounce gold per ton with one grab sample yielding an assay of 0.2 ounce gold per ton. (G. Windsor, *personal communication*). The vein trends 040°, parallel to the foliation in the mafic volcanic host rock.

Stop 3: In the vicinity of an old gold prospect pit, new stripping has exposed outcrop containing several quartz veins that vary in width from 15 to 30 cm. The veins pinch and swell and are hosted by fine to medium grained green chloritic mafic flows. Gold values up to 0.7 ounce per ton have been reported from the main vein pit. At the east side of the trench, fine grained black siliceous altered mafic volcanic rock carries 2 to 3% pyrite and is reported to carry up to 0.25 ounce gold per ton.

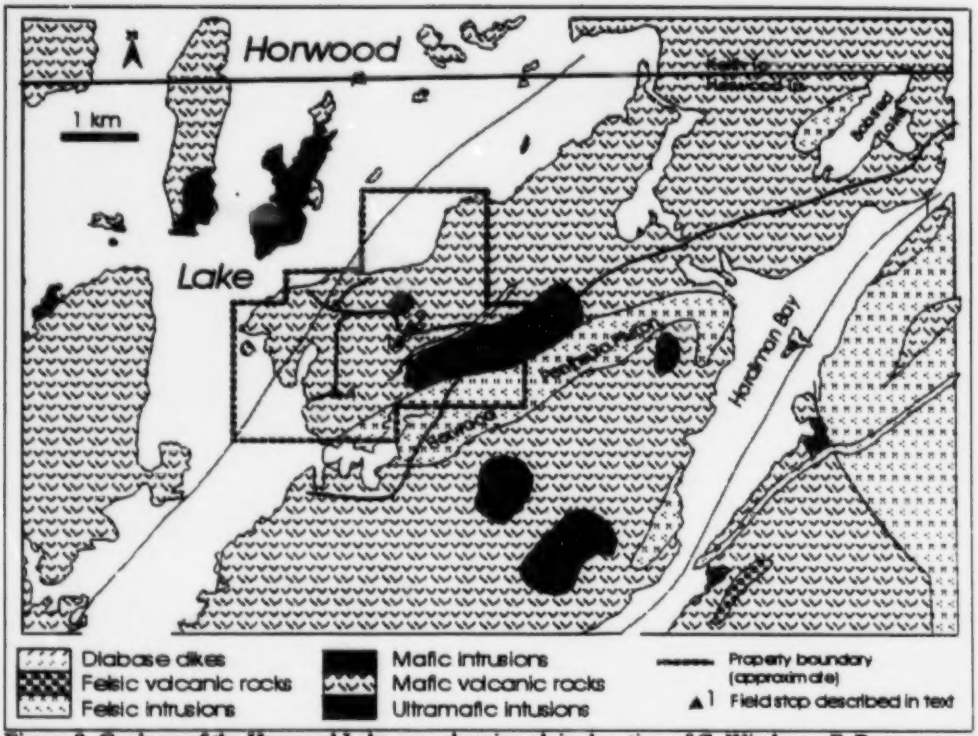


Figure 8. Geology of the Horwood Lake area showing claim location of G. Windsor – F. Ross property. (geology modified from Breaks, 1978).

Stop 4: A roadside outcrop of quartz diorite has been recently blasted. The rock is fine to medium grained, mauve in colour, with subtle pink-red hematite veining. The rock is composed of 50% plagioclase (albite?), plus quartz, chlorite, biotite and amphibole and includes accessory fine grained magnetite and 1% pyrite. The diorite is weakly foliated and carries rare, east-trending quartz veins.

RECOMMENDATIONS FOR EXPLORATION

Diamonds

Clusters of kimberlite pipes occur in the Hudson Bay Lowland west of Attawapiskat. Many of these kimberlite pipes are diamond-bearing and intrude Paleozoic sedimentary cover rocks that overlie Archean and possibly Proterozoic basement rocks. Other clusters of kimberlite pipes and dikes extend from Matheson to Cobalt. All of these kimberlite clusters are Jurassic in age (Sage 1996). Proterozoic diamond bearing kimberlite occurs at Kyle Lake and unusual diamond-bearing rocks occur in the Wawa area. Kimberlite dikes have been identified near Belleville in southeastern Ontario.

The Hudson Bay Lowland and James Bay Lowland are underlain by northward thickening Paleozoic and Mesozoic sedimentary rocks (Johnson et al, 1992). The present southern limit of the sedimentary basin is in fault contact against Archean cratonic rocks of the Canadian Shield.

Current theories on kimberlite emplacement suggest that these unusual rocks, and the diamonds that make them attractive exploration targets, are mantle derived. Such origins imply a deep seated mantle perturbation. Northeastern Ontario is far removed from any subduction zone, so a subduction related origin can be rejected as a mechanism for kimberlite emplacement. A possible cause of mantle perturbation could be sedimentary overloading of the crust. At some critical point (Clifford's rule threshold), crustal

overloading would initiate a mantle response to accommodate crustal subsidence. Although most of the crustal material entering the mantle would be accommodated as mineralogical change and metamorphism with very minor volumetric addition to the mantle budget, the small amount of unaccommodated material could trigger kimberlitic magma eruption. As a result of crustal subsidence, mantle perturbation would be greatest under the thickest part of the sedimentary basin (axis) where kimberlite magma production would reach a maximum. Evidence for a significantly larger Paleozoic sedimentary basin in northeastern Ontario is preserved as the Timiskaming outlier at New Liskeard where Paleozoic sediments outcrop. Figure 9 is a schematic reconstruction of the Paleozoic basin as it may have been in pre-Jurassic time. The Paleozoic basin axis coincides with a kimberlite "line" that extends from Cobalt to Attawapiskat.

Old faults can affect young overlying rocks, see for example, Andjelkovic and Cruden (1998). Where a sedimentary basin overlies pre-existing basement faults, basin subsidence can be affected by those faults. Many of the major Archean faults in Ontario were previously overlain by the Paleozoic basin and the Pashkokogan fault is colinear with the southern boundary of the present day basin. The Archean faults probably penetrate the crust, tap the mantle and could provide conduits for kimberlite emplacement into the basin. Significant Archean mantle faults are depicted in Figure 9; where these mantle faults intersect the Paleozoic basin axis, diamond bearing kimberlite should be sought.

Silica from the Eldorado Ironstone

Metal smelting operations are constantly re-examing metallurgical processes to improve metal recoveries. Preliminary trials suggest fine grained silica is preferrable over lump silica as a fluxing agent in certain metallurgical applications. Due to the fine grained crumbling nature of the chert in Shaw Township, that rock type may be preferable for specific applications. The chert occurs as an interbedded unit with magnetite ironstone of the Eldorado Ironstone and forms a semi-continuous band around the Shaw Dome. With its pronounced magnetic signature and local high relief, the unit can be easily delineated and lends itself to simple open cut extraction.

Volcanogenic Massive Sulphides, Horwood Lake Area

The Horwood Township property of G. Windsor and F. Ross (*see* Property Examinations) is interesting in that it contains base metal mineralization in mafic flows. The presence of sulphide mineralization rimming pillow selvages and pillow interiors are evidence that the area has experienced hydrothermal conditions that were conducive to the precipitation of base metals. The associated chlorite alteration, silicification and possibly other alteration minerals suggest the presence of a volcanogenic massive sulphide system. In addition, the nearby Horwood Peninsula Pluton could have provided a heat source to drive a volcanogenic massive sulphide system, in a scenario akin to that of the Beidelman Bay subvolcanic intrusion in the Sturgeon Lake area, northwestern Ontario. Although there are no large volumes of felsic volcanic rocks in the Horwood Lake area, many of the important features of a volcanogenic massive sulphide deposit are present. Sulphide mineralization, alteration, and the nearby Horwood Peninsula Pluton (a possible subvolcanic intrusion) suggest the area should be scrutinized as a mafic-hosted volcanogenic massive sulphide environment.

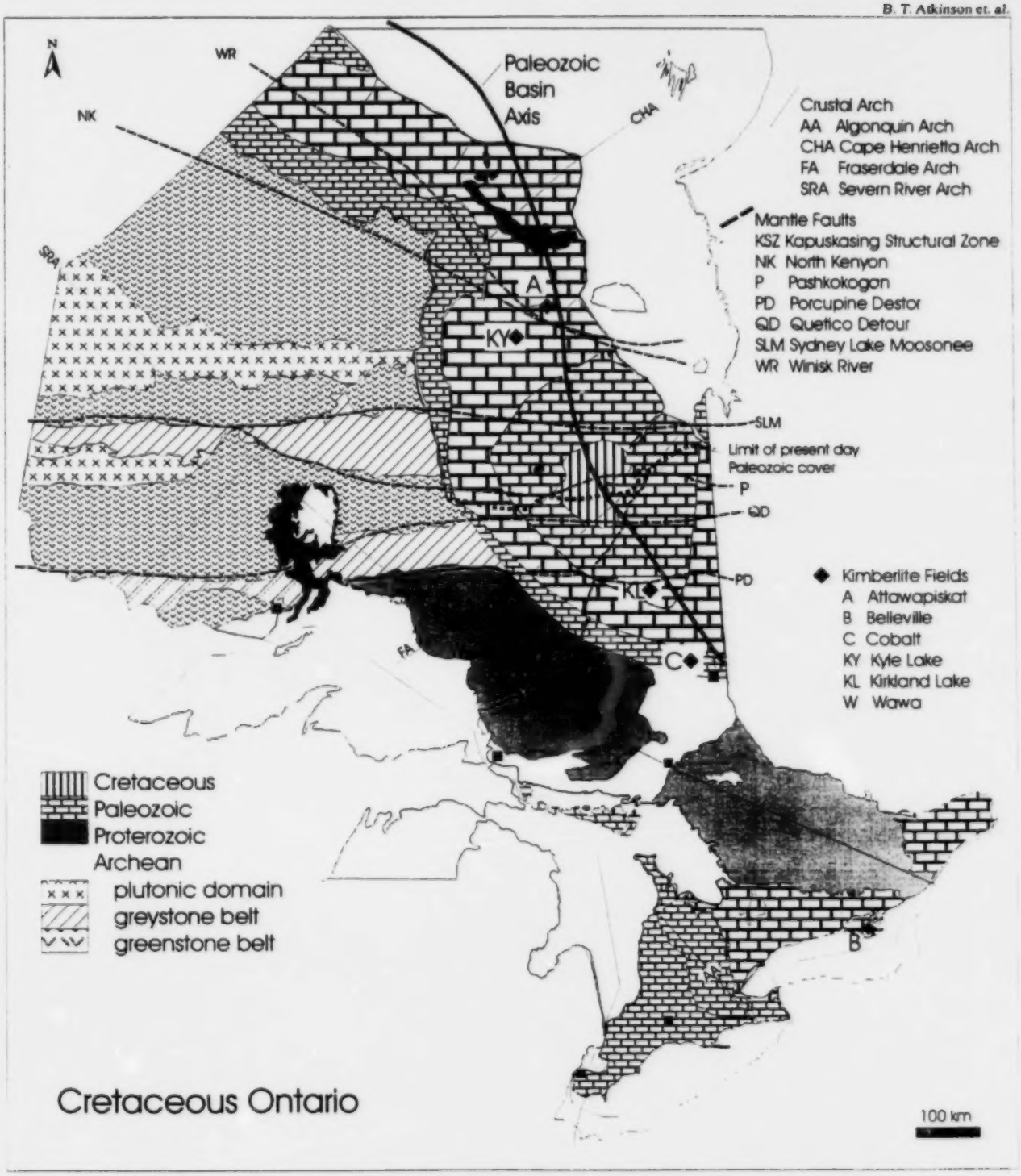


Figure 9. Geological reconstruction of the Paleozoic sedimentary basin in northern Ontario showing the coincidence of kimberlites with the basin axis. Dashed lines are Archean mantle faults that could provide conduits for kimberlite emplacement. (Geology modified from Ontario Geological Survey, 1991).

OGS ACTIVITIES AND RESEARCH BY OTHERS

S. Hamilton (Ontario Geological Survey, Sedimentary Geoscience Section) conducted research on electrochemical dispersion of metals in areas of thick overburden and investigated forest rings northeast of Heast and in Thorburn Township areas.

C. Vaillancourt (Ontario Geological Survey, Precambrian Geoscience Section) completed 1:20 000 scale Precambrian geological mapping in the Watabeag Lake area. This work overlapped the Timmins and Kirkland Lake districts. In the Timmins District, mapping was done in Timmins and Michie townships.

C. T. Barrie (Geological Survey of Canada) continued geological, geochemical and geochronological research on the Kidd – Munro assemblage in Mann Township. Objectives of this work were to 1) examine controls on base metal mineralization, 2) determine if the Mann mafic – ultramafic intrusions represent a heat source for the Kidd Creek volcanogenic massive sulphide deposit, 3) establish correlation of Kidd Munro assemblage rocks with other assemblages in the Abitibi greenstone belt and 4) reevaluate the tectonostratigraphic setting of the area. The research was carried out as the Kidd Munro Extension Project and was a joint government - industry funded program.

Operation Treasure Hunt is a two year $19 million initiative by the Ontario government to stimulate exploration and increase geoscience data in the Province. The program is administered by the Ontario Geological Survey. In the Timmins District, projects being completed under Operation Treasure Hunt include airborne geophysical surveys in the Cochrane area and between Timmins and Kirkland Lake. Lake bottom sampling is being done in the Chapleau to Kapuskasing area and stream sediment sampling will be completed over a large area of the Kapuskasing Structural Zone. Indicator mineral sampling will be carried out in areas of the James Bay and Hudson Bay lowlands.

ACKNOWLEDGEMENTS

Information on past work reported in the Property Examinations section was obtained from assessment files unless otherwise noted. Statistics and production information from the operating mines were kindly provided by mine personnel and are gratefully acknowledged. Prospectors, geologists and explorationists provided knowledge, discussion and insight on the district geology, exploration projects, properties and mineral occurrences; their input is appreciated.

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Middleton, R. S. 1974. Magnetic survey of Loveland and Macdiarmid Townships, District of Cochrane; Ontario Division of Mines, GPR2, 26p. Accompanied by Map 2288, scale 1 inch to ½ mile.

Ontario Geological Survey 1990. Airborne electromagnetic and total intensity magnetic survey, north Swayze – Montcalm area; Ontario Geological Survey, Maps 81382, 81383, 81386, 81387, Scale 1:20 000.

Ontario Geological Survey 1991. Bedrock geology of Ontario; Ontario Geological Survey, Maps 2541, 2542, 2543 and 2544, scale 1: 1 000 000.

Veillette, J. J. and McClenaghan, M. B. 1996. Sequence of ice flow in the Abitibi – Timiskaming region: implications for mineral exploration and dispersal of carbonate rocks from the Hudson Bay Basin, Quebec and Ontario; Geological Survey of Canada, Open File 3033, scale 1:500 000.

Table 6. Publications received by the Timmins Regional Resident Geologist's Office in 1999.

Title	Author	Type and Year of Publication
Structural evolution of the central Michipicoten greenstone belt, Superior Province, Wawa, Ontario	Arias, Z.G.	Queen's University M.Sc. Thesis, 1996
Drift Exploration in Glaciated Terrain; 19th I.G.E. Symposium short course	Assoc. of Expln. Geochemists	Seminar, 1999*
Report of Activities, 1998, Resident Geologists Program: Timmins and Sault Ste. Marie	Atkinson, Hailstone, Pressacco, Wilson, Draper, Hope, et al	OGS Open File Report 5990, 1999
Summary of Field Work and other activities, 1999	Ayer, Baker, Kelly, et al, eds.	OGS Open File Report 6000, 1999
LAKE ABITIBI AREA	Ayer, Berger & Trowell	OGS MAP P.3398, 1999
CD: Geological compilation of the Lake Abitibi Area, Abitibi Greenstone Belt	Ayer, Trowell, Berger, et al	Dataset MRD 46, 1999
Historical Archaeological Features at Hill's Landing	Ball, D.R. & Pollock, J.W.	Text/Report, 1976
BEATTY and MUNRO TOWNSHIPS	Barrie, C.T.	OGS MAP P.3395, 1999
DUNDONALD and CLERGUE TOWNSHIPS	Barrie, C.T.	OGS MAP P.3394, 1999
BROWER, DUFF, FOURNIER, etc (12 twps)	Barrie, C.T.	OGS MAP P.3391, 1999
BOWYER, COULSON, GALNA, etc (11 twps)	Barrie, C.T.	OGS MAP P.3392, 1999
FOX, STIMSON, PYNE, etc (11 twps)	Barrie, C.T.	OGS MAP P.3393, 1999
Hydrothermal alteration and fluid inclusion geochemistry of auriferous deformation zones and vein systems, S.W. Michipicoten greenstone belt, Ontario	Bas, B.	University of Windsor M.Sc. Thesis, 1992
Petrography of the Ruth, Josephine and Goulais River iron ranges, District of Algoma	Beland, R.	University of Toronto M.A. Thesis, 1944*
Geology of Murphy and Wark Townships, District of Cochrane	Berger, B.R.	OGS Open File Report 5994, 1999
Report of Activities, 1998, Resident Geologists Program: Red Lake and Kenora	Blackburn, Hinz, Storey, Kosloski and Ravnaas	OGS Open File Report 5987, 1999
A petrological study of the central pluton of the Mishibishu Lake belt, District of Thunder	Blomberg, P.	University of Toronto B.Sc. Thesis, 1988
Petrography and chemistry of the Three-Mile-Post anomaly, Jacobson Township, District of Algoma	Booth, K.D.	Carleton University B.Sc. Thesis, 1983
Petrography and paragenesis of the siderite orebody, Macleod Mine, Wawa, Ontario	Cohen, M.H.	Bowling Green State University M.Sc. Thesis, 1989*
Geologic appraisal of dimension-stone deposits: a background and field guide for the geologic study of commercial stones	Currier, L.W.	USGS Bulletin, 1960*
MERC Guidebook Series, Vol 1: Classic komatiite localities and magmatic Fe-Ni-Cu-PGE sulphide deposits of the Abitibi Greenstone Belt, Ontario – Quebec	Davis, P.C.	Field Guide, 1999*

Title	Author	Type and Year of Publication
Volcanic stratigraphy of late Archean Kidd-Munro assemblage in Dundonald...and genesis of associated nickel & copper-zinc volcanogenic massive sulphide deposits, Abitibi greenstone belt	Davis, P.C.	University of Alabama M.Sc. Thesis, 1997*
Annual Report: 96-97 Environmental Information Partnership (Moose River Basin)	MNR Environmental Information Partnership	Text/Report, 1997
Occurrence and Genesis of the Gold Concentration on the Monk Claims, Wawa, Ontario	Ferguson, J.D.	University of Western Ontario H.B.Sc. Thesis,.1986
The significance and variability of iron formation as silicate facies, and sulphide facies in black shale, about exhalative ore deposits	Fyfe, Hutchinson, Hodder & Kerrich	Text/Report, 1981
Joint Annual Meeting: Abstract Volume 24, Sudbury, 1999	GAC / MAC	Convention/Symposium, 1999
Quaternary features and scenery along the North Shore of Lake Superior; XIIth INQUA Congress Field Excursion C-12	Geddes, Kristjansson & Teller	Field Guide, 1987
Flat Veins at the Hollinger Mine, Timmins, Ontario	Hall, David J.	Queen's University M.Sc. Thesis
Lake sediment geochemical survey of the Cow River Area, Batchewana Greenstone Belt; to accomp OGS OFR 5917	Hamilton, Fortescue & Hardy	Dataset MRD 09, 1995
Preliminary results from the Murray Lake Project: A detailed lake sediment geochemical survey in the Central Michipicoten Greenstone Belt east of Wawa, Ontario; to accomp OGS OFR 5932	Hamilton, Fyon & Fortescue	Dataset MRD 17, 1995
Lake sediment geochemical database: Peterlong Lake - Radisson Lake area; to accomp. OGS OFR 5942 and MRDs 24, 25	Hamilton, S.M.	Dataset MRD 27, 1996
Precious metal geochemistry of the Helen siderite, MacLeod Mine, Wawa, Ontario	Harding, T.A.	Bowling Green State University M.Sc. Thesis, 1989*
CD: Selected posters summarizing research results from the Swayze greenstone belt, Ontario (aka GSC OF D3771)	Harris, J.R. & Wilkinson, L.	Dataset MRD 48, 1999
CD: A compilation of OGS, GSC and industry geoscience data over the Swayze greenstone belt, Ontario (aka GSC OF D3770)	Harris, Wilkinson & Vanderkam	Dataset MRD 47, 1999
SWAYZE GREENSTONE BELT	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384a, 1999
ROLLO LAKE	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384b, 1999
RUSH LAKE	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384c, 1999
MATTAGAMI LAKE	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384d, 1999
SULTAN	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384e, 1999
OPEEPEESWAY LAKE	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384f, 1999
GOGAMA	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384g, 1999
BISCOTASING	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384h, 1999

Title	Author	Type and Year of Publication
WESTREE	Heather, K.B. & Shore, G.T.	GSC MAP Open File 3384I, 1999
Report on some mineral occurrences in Godfrey and Turnbull townships	Hogg, N.	Text/Report, 1950
Geology of the Algold Mine, Goudreau area, Ontario	Keeler, G.T.	University of Toronto, M.A. Thesis, 1940
The evolution of the Mishibishu greenstone belt, near Wawa, Ontario	Keller, R.J.	University of Windsor M.Sc. Thesis, 1989
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The significance of chloritoid within the footwall volcanic rock of the Helen iron range, Wawa, Ontario	MacMillan, D.	University of Western Ontario B.Sc. Thesis, 1981*
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Canadian Minerals Yearbook: Review and outlook [selected commodity excerpts from Internet site]	Natural Resources Canada	Text/Report
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A fluid inclusion study of gold bearing quartz veins in central McMurray Township, Michipicoten greenstone belt, Ontario	Pare, C.G.	University of Windsor B.Sc. Thesis, 1989
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Geology of the Cunningham 42 base metal prospect, Kidd Creek Mines Ltd.	Rye, K.A.	University of Waterloo H.B.Sc. Thesis, 1984

Title	Author	Type and Year of Publication
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Kimberlites of the Lake Timiskaming Structural Zone (with MRD 20)	Sage, R.P.	OGS Open File Report 5937, 1996
Geology and stratigraphy of the Michipicoten iron formation (ILSG 33rd Annual Meeting)	Sage, Thorpe & Berdusco	Field Guide Vol 33 Pt 3, 1987
Report of Activities, 1998, Resident Geologists Program: Southern Ontario	Sangster, McGuinty, Papertzian, Steele, Lee, et al	OGS Open File Report 5992, 1999
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The geology and petrology of the Firesand River carbonatite complex, northwestern	Teal, S.E.	McMaster University M.Sc. Thesis, 1979
Mining Explained: A layman's guide	The Northern Miner; Whyte & Danielson, eds	Text/Report, 1998

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Stratigraphy, lithology, petrography and depositional environments of the Dore Sediments proximal to the Lucy Iron Range, Wawa, Ontario	Thomas, D.A.	Carleton University H.B.Sc. Thesis, 1984*
Setting New Standards: Recommendations for public mineral exploration and mining companies. Final Report of the Mining Standards Task Force	TSE & Ontario Securities Commission	1999
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International Land Reclamation & Mine Drainage Conference: Vol. 3 of 4: Reclamation & Revegetation	U.S. Department. of the Interior	Text/Report SP 06C-94, 1994*
International Land Reclamation & Mine Drainage Conference: Vol. 4 of 4: Abandoned mine lands and topical issues	U.S. Department. of the Interior	Text/Report SP 06D-94, 1994*
The enigmatic rings of the James Bay Lowland: a probable geological origin	Veillette, J.J. & Giroux, J-F.	GSC Open File Report 3708, 1999
Northern Ontario phosphate rocks: factors in their technical evaluation	Vos, M.A. & Ash, D.R.	Text/Report, 1992
The Lucy orebody: its petrology, structure, and origin; Michipicoten District, Ontario	Young, W.L.	McGill University M.Sc. Thesis, 1951*
The iron bearing formations of the Michipicoten area, Ontario	Young, W.L.	McGill University Ph.D. Thesis, 1953*

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Ontario

Ontario Geological Survey
Regional Resident Geologist Program

Timmins Regional Resident Geologist District (Wawa Area) – 1999

by

A. C. Wilson, P. J. Hope and P. M. Morra

2000

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TIMMINS REGIONAL RESIDENT GEOLOGIST (WAWA AREA) – 1999

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INTRODUCTION

Although low commodity prices continued to influence the level of exploration in the Wawa area, several significant agreements reached throughout the year brightened the overall exploration picture.

Both the high-grade Edwards Mine and the Eagle River Gold Mine continued their low-cost production throughout the year. By the end of the year, River Gold Mines Ltd. had completed expansion of their mill and was re-evaluating the feasibility of their shaft-sinking program at the Eagle River Mine. The company also announced that they had agreed to purchase the two mining leases that constitute the Edwards Mine, from VenCan Gold Corporation. This purchase will take effect early in 2000.

In March, Canabrava Diamond Corporation and Paramount Ventures & Finance Inc. announced the signing of an option/joint venture agreement with Kennecott Canada Exploration Inc. to explore their Ontario properties for diamonds. Kennecott will have the exclusive right to acquire a 60% interest in the properties by spending $25 million within 7 years. The signing of this agreement indicates the continued interest in the exploration for diamonds along the Kapuskasing Structural Zone in Ontario.

At the end of the year, Tri-Origin Exploration Ltd. had signed a letter of intent with Citadel Gold Mines Inc. to explore Citadel's land holdings in McMurray Township. In order to earn a 51% interest, Tri-Origin will fund $1.5 million of exploration on the property over five years. The Citadel property consists of 172 leased, patented and unpatented mining claims and includes seven past-producing gold mines. These mines historically produced 120 109 ounces of gold, at an average grade of 0.26 ounce per ton gold and the remaining resources are estimated to be 710 000 tons grading 0.125 ounce per ton gold.

Two bulk samples were extracted from the Goudreau Lake Deformation Zone during the fall by Pele Mountain Resources Inc. and River Gold Mines Ltd.. The success of these bulk sampling programs reinforces the exploration and development potential in the Goudreau – Lochalsh area, one of the most historically productive areas in the Michipicoten greenstone belt.

Twenty active exploration programs were documented in the Wawa area during the year, including 10 projects funded by the Ontario Prospectors Assistance Program (OPAP).

A summary of the assessment files received for the Wawa area in 1999, and filed at the Timmins Regional Resident Geologist Office is found in Table 3. As of the end of June 1999, all of the Wawa area assessment files, along with all related reference materials had been moved from Sault Ste. Marie to Timmins.

MINING ACTIVITY

Total production and reserves for the two mines operating in the Wawa area is summarized in Table 1. Historic gold production for the Michipicoten greenstone belt is summarized in Table 2. The locations of the producing mines can be found on Figure 1.

River Gold Mines Ltd. – Eagle River Mine

The Eagle River Mine is located on the north shore of Lake Superior, approximately 50 km west of the town of Wawa, in the Mishibishu Lake greenstone belt. Accessed to the mine and mill facilities is via a 70 km long gravel road leading south from the Trans-Canada Highway. The River Gold mill is located 17 km north of the Eagle River Mine.

The recently completed $1.4 million company mill expansion program initiated in 1998, included the installation of a ball mill, replacement of gold presses, repair of existing filters and addition of a fourth filter, as well as the modification of solution and slurry circuits. By mid-year, mill production had expanded from 600 tonnes per day to 900 tonnes per day. The mill employs the Merrill-Crowe zinc precipitation process. Coarse ore is crushed, ground to a powder and then mixed with fluid reagents which dissolve the gold into solution (River Gold Mines Ltd., *press release*, November 12, 1999).

Because of the low price of gold, the shaft-sinking program at the mine was deferred. It is anticipated that the program will resume during 2000. The vertical shaft is planned to a depth of 400m and will cost about $5 million (River Gold Mines Ltd., *press release*, November 12, 1999). Presently, the mine is accessed by a decline ramp to 330 m and all mining is currently conducted above the 280 m level. Mining operations utilize trackless equipment and employs shrinkage and longhole stoping methods.

Deep underground exploration conducted during the year intersected significant high-grade gold values, grading between 4.34 g/t gold and 72.73 g/t gold, across a strike length of 150 m between the depths of 375 to 450 metres. These intersections indicate a depth extension of the No. 6 Zone. Production, to date, from the No. 6 Zone has been above 220 metres with development to a maximum depth of 300 m. The high grades and the presence of multiple, parallel zones intersected by some of the drill holes will have a positive impact on the reserve figures for the mine (River Gold Mines Ltd., *press release*, April 30, 1999).

Surface exploration is currently concentrated on the No. 8 Zone, located to the south of the minesite. Recent shallow drilling extended the strike length of a known ore block by 50 m. Results of this drilling include intersections of 27.28 g/t gold over 1.6 metres, 76.52 g/t gold over 2.1 metres and 31.88 g/t gold over 3.1 metres (River Gold Mines Ltd., *press release*, November 12, 1999).

River Gold Mines Ltd. has initiated the permitting process in order to begin mining the Mishi Deposit. The Mishi Deposit contains a probable open pit reserve of 454 000 tonnes at a grade of 3.13 g/t gold, to a depth of 35 metres. This deposit is located approximately 2 km west of the River Gold mill (River Gold Mines Ltd., 1998 Annual Report).

The River Gold Mine employs 140 people. The mine manager is Gerry McDonald and the Chief Engineer is Ron Moran.

River Gold Mines Ltd. – Edwards Mine

River Gold Mines Ltd. finances, manages and mines the Edwards Mine under terms of a March 1996 agreement with VenCan Gold Corporation. On December 16, 1999, the two companies announced an agreement whereby River Gold Mines will purchase the two mining leases that comprise the Edwards Gold Mine, plus VenCan's Plowman claim, from VenCan Gold Corporation. The leases were purchased for $1.5 million, plus a 3% net

Table 1. Mine production and reserves in the Wawa Area 1999.

Mine	Production to end of 1998		Production in 1999		Reserves at end of 1998	
	Tonnage @ Grade	Total Commodity	Tonnage @ Grade	Total Commodity	Tonnage	Grade
River Gold Mines Ltd., Eagle River Mine	607 261 tonnes @ 11.79 g/t	204 568 oz Au	192 500 tonnes @ 10.2 g/t*	63 400 oz Au*	1 287 000 tonnes	10.44 g/t
River Gold Mines Ltd., Edwards Project	97,125 tonnes @ 14.0 g/t	43,846 oz Au	69 000 tonnes @ 12.0 g/t**	26 600oz Au**	146 600	19.75 g/t

**Eagle River Gold Mine production figures to September 30, 1999 (River Gold Mines Ltd., press release, November 12, 1999)*
*** Edwards Mine production figures to November 8, 1999 (VenCan Gold Corporation Annual Report, December 2, 1999)*

smelter royalty on all mine production after January 1, 2000 (River Gold Mines Ltd. – VenCan Gold Corporation, *press release*, December 16, 1999).

The Edwards Mine is located in Jacobson Township, 100 km northeast of the River Gold mill. Ore from the mine is trucked to the mill, stockpiled and then run through the mill in a single batch. By November 8, 1999, 26 600 ounces of gold was recovered from 69 000 tonnes milled, yielding an average recovered grade of 12.0 g/t gold (VenCan Gold Corporation, 1999 Annual Report, December 2, 1999).

The decline has now been advanced to the 227-metre vertical level with sublevels developed on the 200 and 225 metre levels to access ore from the three main zones under development. The Porphyry, Carbonate and Shaynee Zones all continue to show exceptional promise with respect to consistency of grade, predictability and continuity. All three zones have shown an increase in mineable strike lengths. The Carbonate Zone in particular, has shown an increase in mineable widths with depth, allowing for the employment of less costly longhole mining methods (VenCan Gold Corporation, 1999 Annual Report, December 2, 1999).

Ron Prince is the general mine foreman at the Edwards Mine and approximately 60 people are employed at the site.

ADVANCED EXPLORATION

As a result of the rising price of gold toward the end of the year, bulk samples were extracted from both the Markes Property in Jacobson Township and the Vega Property on the township boundary between Jacobson and Riggs townships. The locations of both properties are shown on Figure 1. Both properties lie within the Goudreau Lake Deformation Zone which is up to 4.5 km wide and trends in a gentle sigmoidal form from approximately 090° in the west, through 070°, to about 095° in the east, over a distance of approximately 30 km (Heather and Arias 1992). This deformation zone hosts all of the historic gold production from the Goudreau – Lochalsh area. The deformation zone also hosts known mineral resources associated with both the past-producing Magino and Kremzar gold mines (*see* Table 5).

Pele Mountain Resources Inc. – Markes Property

During the fall, Pele Mountain Resources Inc. extracted a 10 000 tonne bulk sample from their 100% owned Markes property in Jacobson Township. The average grade of the first 9260 tonnes milled was 4.9 g/t gold (Pele Mountain

Table 2: Gold Production from the Wawa District to the end of 1999

Mine Name	Township	In Production	Tons Milled	Oz. Au	Grade
Alden-Goudreau	Cowie	1937, 40, 43, 45	13 479	3220	0.276
Centennial	Naveau	1939-40	8612	610	14.1
Cline	Jacobson	1938-40, 1947-48	331 842	63 328	5.2
Darwin/Grace	McMurray	1902-03, 07-08, 10, 23, 25, 30, 35, 37, 40, 43-44	45 528	15 191	3.0
Deep Lake	McMurray	1936-1938, 1943	2790	1633	1.7
Eagle River	Point Isacor	1995-	710 868	247 993	11.1 g/t
Edwards	Jacobson	1938	1537	485	3.2
		1997-	166 125	69 812	12.9 g/t
Holdsworth Prospect	Corbiere	1933	60	10	6
Kremzar	Finan	1988-90	392 858	37 678	4.5g/t
Magino/Algoma Summit	Finan	1930-40, 1988-92	768 679 +	113 228	4.5 g/t
Magnacon	Mishibishu Lake	1989-90	165 000	15 356	10.7
Minto (includes Jubilee and Cooper)	McMurray	1929-1942	184 600	37 678	4.9
Murphy/Algold /Amherst	Abotossaway	1926-32, 36-38, 1940	23 211	2450	9.5
Norwalk/Manxman	Naveau	1904, 1910	820	60	13
Parkhill	McMurray	1902, 29, 30-38, 40-44	125 778	54 301	2.3
Ranson	Rabazo	1939	774	156	4.96
Renabie	Leeson	1947-70, 1981-91	5 583 895	1 100 000	0.2
Smith/Van Sickle	McMurray	1935-36	9228	536	17.2
Stanley	McMurray	1936	1963	84	23.3
Surluga	McMurray	1968-69, 1988-89	87460	8898	n.a.

Resources Inc., *press release*, November 18, 1999). Ore was trucked from the site and was milled by Battle Mountain Canada Ltd. at the Golden Giant mill at Hemlo.

The Markes property is located approximately 60 km due north of Wawa and is adjacent to the past-producing Cline Mine property as well as the producing Edwards Mine. The property lies within the eastern domain of the Goudreau Lake Deformation Zone.

In 1937, Erie Canadian Mines reported that the main ore body, which had been blocked out for 159 feet along strike and over a width of 13.4 feet, contained 71 000 tons of ore at an average value of $8.40 per ton gold (Mitchell, 1939). Esso Minerals Canada Ltd. completed a diamond-drilling program (27 drill holes for a total of 2316 m) on

the property in 1987. Based on their work, the company calculated a resource of 75 000 tonnes, averaging 5.75 g/t gold for a zone approximately 110 m long and averaging 3.96 m wide (Archibald 1998).

Following the completion of the bulk sample, Pele Mountain initiated a diamond-drilling program to delineate additional gold resources beneath the floor of the pit. The results of this drilling will assist in establishing the feasibility of mining additional ore from the Markes Property.

River Gold Mines Ltd. – Vega Project

In December, River Gold Mines Ltd. removed a bulk sample of approximately 3000 tonnes from Pele Mountain Resources Inc.'s Vega property in Riggs Township. By mid January, River Gold had milled about 1500 tonnes of material and reported an average grade of 5.0 g/t gold. River Gold reported that although the main vein itself had good gold grades, the overall dilution of the sample was very high (R. Moran, River Gold Mines Ltd., *personal communication*, January 11, 2000).

The Vega property, also known as the Three Mile Post Occurrence or the Markes 'A' Zone, is located approximately 27 km east of the town of Dubreuilville, and 4 km south of the community of Lochalsh. All ore was trucked from the property and milled at River Gold's mill located 17 km north of the Eagle River Mine. The property lies close to the extreme east end of the Goudreau Lake Deformation Zone. This easterly-trending deformation zone has been interpreted by Heather and Buck (1988) to terminate at the north-northwest trending Dog Lake Fault, located in west central Riggs Township.

Although the property was extensively drilled in the past by prospectors R. Campbell and D. Burt in 1975-1977, Vega Gold Explorations Inc. in 1980-1982, Hemlo Gold Mines in 1993 and Pele Mountain Resources in 1997, no estimated reserves have been published on the property.

EXPLORATION ACTIVITY

The location of exploration activities conducted in the Wawa area in 1999 is shown on Figure 1 and summarized in Table 4. Table 3 summarizes the assessment files received in the Timmins Regional Resident Geologist Office during 1999. Details on selected mineral deposits not being mined in the Wawa area are outlined in Table 5.

Battle Mountain Gold Ltd. – Mishi Creek (Dorset Zone) Property

Early in the year, Battle Mountain Gold drilled an additional 5 diamond drill holes, totalling 1923 m, on the Mishi Creek (Dorset Zone) property in the Mishibishu greenstone belt. These 5 drill holes are in addition to the 16 diamond drill holes (2894 m) drilled on the property in 1998.

This property is a joint venture between Battle Mountain Gold Ltd. and Murgor Resources Inc.. Battle Mountain has favourably compared the mineralization on the property to the mineralization found in both the Timmins and Holloway mining areas (Battle Mountain Gold Ltd, 1998 Annual Report). The Dorset Zone is a stratabound gold zone that dips 055° north and plunges 060° west. It is hosted within a sheared sequence of foliated mafic metavolcanic rocks and clastic metasedimentary rocks. The zone is moderately albitized and weakly ankeritized and contains up to 3% pyrite, 1-5% arsenopyrite and trace chalcopyrite. Significant intersections obtained during the diamond-drilling program include: 2.46 g/t gold over 1.9m in MC-99-31, 3.01 g/t gold over 2.9 m in MC-98-22, 1.48 g/t gold over 2.6 m in MC-98-26 and 4.78 g/t gold over 8.25 m in MC-98-25 (Battle Mountain Gold Ltd. 1998, 1999).

Approximately 1 km northwest of the Dorset Zone, in the Bonnema Bog area, Battle Mountain also intersected the KK Zone. This zone consists of a sequence of sheared variolitic and pillowed mafic metavolcanic rocks. The zone is strongly carbonatized and shows weak hematization at the bottom. It is mineralized with approximately 1% pyrite and pyrrhotite and 1-5% arsenopyrite (Battle Mountain Gold Ltd. 1998, 1999).

Table 3. Assessment files received for the Wawa Area in 1999.

Abbreviations

AEM ..... Airborne electromagnetic survey
AM ..... Airborne magnetic survey
ARES ..... Airborne resistivity survey
Beep ..... Beep Mat survey
Comp ..... Geological compilation
DDH ..... Diamond drill hole (s)
GC ..... Geochemical survey
GL ..... Geological survey
GM ..... Ground magnetic survey
HM ..... Heavy mineral sampling
IP ..... Induced polarization survey
Lc ..... Linecutting
OP ..... Ontario Prospectors Assistance Program
Petrog ..... Petrography
Pr ..... Prospecting
Samp ..... Sampling (other than bulk)
Str ..... Stripping
Tr ..... Trenching
VLFEM ..... Very low frequency electromagnetic survey

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Abbie Lake	Eveleigh, A.	1997	Assays, Samp, Tr	OP97-27	WP Abbie Lake - 20
Abotossaway	Patricia Mines Inc.	1998	Assays, GC, GL, Pr	2.19336	WP Abotossaway - 28
Abraham	Mealey, W.B.	1998	Assays, GC, Tr	2.19168	WP Abraham - 07
Brackin	Fraser, M.J.	1997	Assays, Beep, Pr, Samp, Str	OP97-14	WP Brackin - 41
Chabanel	Hutteri, H.P.	1998	Assays, GL, GM, Pr, Tr	2.19337	WP Chabanel - 30
Cowie	Markes, W.E.	1933-52	Assays, Pr, Samp, Tr	Donation	WP Cowie - 03
David Lake	Mishibishu Gold Corporation	1997	Assays, GC, Lc	2.19043	WP David Lake - 45
Debassige	Bowes, J.W.	1998	Assays, Pr, Samp, Str	2.19033	WP Debassige - 04
Debassige	Porcheron, A. R.	1999	Assays, Pr, Samp, Str	2.19595	WP Debassige - 06
Debassige et al. (12 townships)	Canabrava Diamond Corporation	1998	AEM, AM, ARES, GC, HM, Petrog	2.19279	WP Debassige - 05
Echum, Dolson	2973090 Canada Inc.	1998	Assays, GL, IP, Lc, Pr	2.19171	WP Echum - 05
Finan	Patricia Mines Inc.	1997	Assays, DDH - 14 - 5131m	2.19448	WP Finan - 62
Finan	Golden Goose Resources Inc.	1997-98	Assays, GL, Tr	2.19607	WP Finan - 64
Franchere	Harley, W.R.	1984-85	Assays, Comp, GL, Petrog	Donation	WP Franchere - 12
Hambleton	Corona Gold Corporation	1998	Assays, Str, Tr	2.19545	WP Hambleton - 15
Hambleton, Odlum	Corona Gold Corporation	1998	Assays, DDH - 53 - 9937m, Tr	2.19793	WP Hambleton - 16
Hambleton, Odlum, Strickland	Corona Gold Corporation	1998	IP, Lc, VLFEM	2.19237	WP Hambleton - 14
Hawkins	Lamarche, N.G.	1998	Assays, Pr, Tr	2.18971	WP Hawkins - 24
Hawkins	McKinnon, D.	1999	DDH - 1 - 217m	2.19550	WP Hawkins - 26
Jacobson	Clement, C.C.	1997	Assays, Pr, Samp	2.19145	WP Jacobson - 68

Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Jacobson	Healey, D. R.	1998	Assays, GC, Lc, Pr	2.19302	WP Jacobson - 69
Jacobson, Riggs	Pele Mountain Resources Inc.	1997	Assays, GC, GL	2.19467	WP Jacobson - 70
Lastheels	Feder, E.	1998	Assays, Pr, Samp	2.19232	WP Lastheels - 08
McMurray	1138992 Ontario Limited	1998	Assays, Pr, Samp	2.18927	WP McMurray - 76
Meath, Rennie	Noront Resources Ltd.	1999	Assays, Pr, Samp	2.19508	WP Meath - 09
Meath, Rennie, West	Freewest Resources Canada Inc.	1998	GC, GL, GM, Lc, VLFEM	2.18864	WP Meath - 10
Mishibishu Lake	Battle Mountain Canada Ltd.	1998	Assays, DDH - 16 - 2894m	2.19474	WP Mishibishu Lake - 59
Nameigos	Kakeeway, D.N.	1998	Assays, Pr	2.19611	WP Nameigos - 03
Pilot Harbour	Thunder Sword Resources Inc.	1998	GL	2.18711	WP Pilot Harbour - 20
Point Isacor	River Gold Mines Ltd.	1998	Assays, DDH - 59 - 7076m	2.19615	WP Point Isacor - 17
Point Isacor	River Gold Mines Ltd.	1997	Assays, DDH - 24 - 3471m	2.19755	WP Point Isacor - 18
Riggs	Longbow Exploration Inc.	1998	Assays, GC, Samp	2.18881	WP Riggs - 46
Riggs	Patricia Mines Inc.	1998	Assays, GL, Pr, Tr	2.19336	WP Riggs - 47
Riggs	Loydex Resources Inc.	1998	Assays, GL, Pr, Samp	2.19211	WP Riggs - 48
Riggs	Pele Mountain Resources Inc.	1999	Assays, GL	2.19556	WP Riggs - 49
Stover	Lucuik, G.	1997	Assays, GC, Samp	OP97-12	WP Stover - 11
Stover	Kerr, W.C.	1999	Assays, GL, Lc, Pr, Samp	2.19689	WP Stover - 12

Corona Gold Corporation – Harte Resources Corporation – Sugar Zone

Corona Gold Corporation released a gold resource calculation on the Sugar Zone in the Dayohessarah Lake greenstone belt early in 1999. This calculation is based upon the 53-hole (9937 m) diamond-drilling program conducted by the company on the property in the fall of 1998. A resource of 692 000 tonnes at a grade of 6.9 g/t gold over an average true width of 1.7 m has been substantiated for the property (*The Northern Miner*, April 26 – May 2, 1999, p.18). The property is located in Hambleton and Odlum townships and lies approximately 25 km north of the town of White River.

Gold is present in two distinct horizons, the Upper and Lower Zones, and lies within a major structure that has been traced over 3 km. The two horizons strike north-northwest and dip 065° west. Both zones consist of one or more thin, quartz porphyry sills within pillowed mafic metavolcanic rocks (Corona Gold Corporation, 1998 Annual Report). Stott (1999) indicates that the quartz veins of the Sugar Zone are hosted within strongly foliated, amphibolitized, basaltic flows injected by abundant felsic sills that are either very fine-grained, or contain quartz or feldspar phenocrysts. Structurally, it is suggested that the Sugar Zone lies not within a zone of shearing, but within a zone of strong flattening and subvertical stretching. This flattening, as well as the injection of the felsic sills, has been interpreted as being related to the injection of the Strickland pluton to the east of the Dayohessarah greenstone belt (Stott 1999).

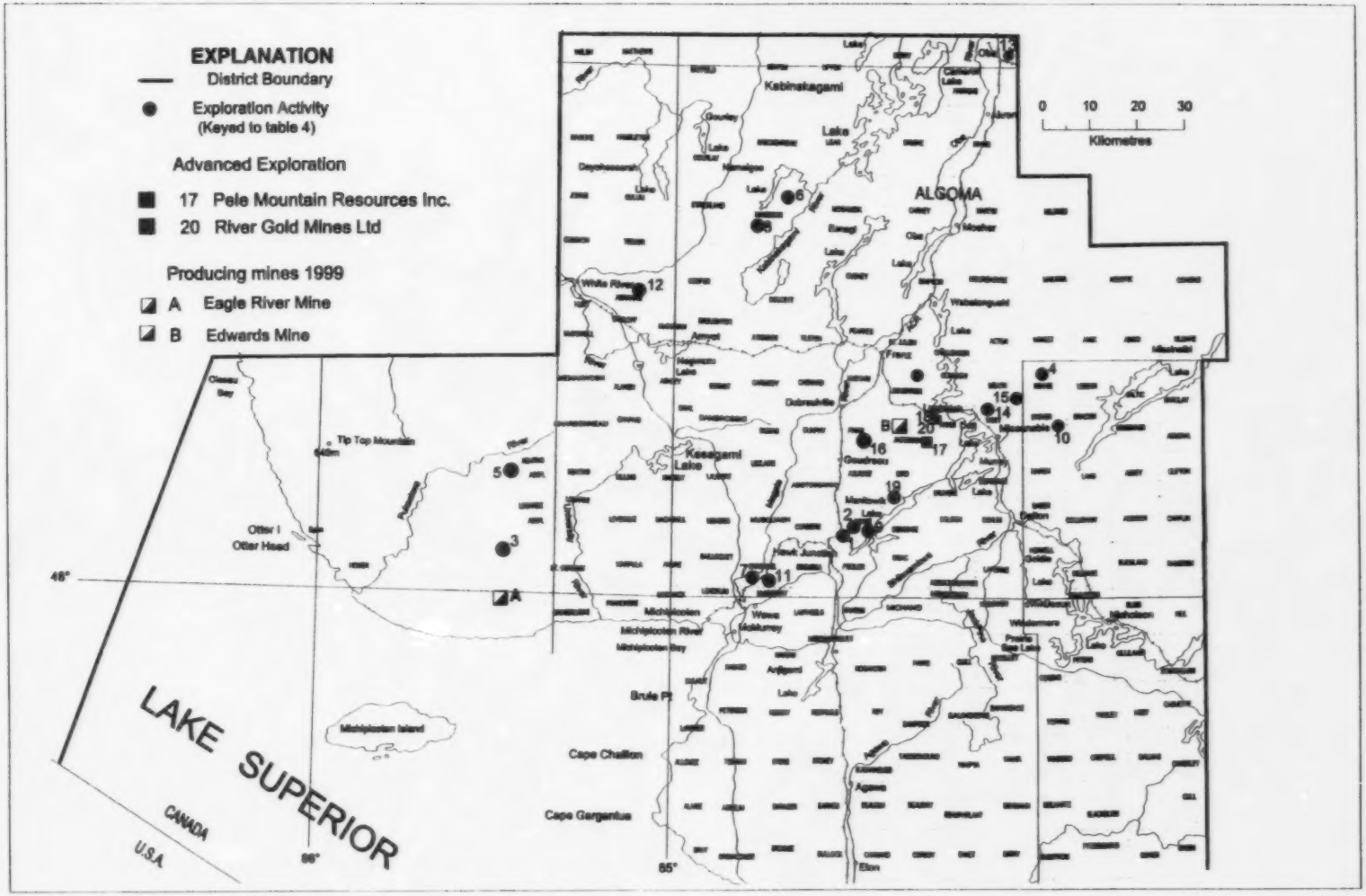

Figure 1. Wawa area, exploration, development and mining activity, 1999

Table 4. Exploration activity in the Wawa Area in 1999.

Abbreviations

AEM ..... Airborne electromagnetic survey
AM ..... Airborne magnetic survey
Bulk ..... Bulk sampling
DD ..... Diamond drilling
DDH ..... Diamond drill hole(s)
GC ..... Geochemistry
GL ..... Geological Survey
GM ..... Ground magnetic survey
GP ..... Ground geophysical survey
HM ..... Heavy mineral sampling
HLEM ..... Horizontal loop electromagnetic survey
Lc ..... Linecutting
Pr ..... Prospecting
Samp ..... Sampling (other than bulk)
Str ..... Stripping
Tr ..... Trenching
VLFEM ..... Very low frequency electromagnetic survey

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
1	Babcock, G.	Corbiere, Cowie tp. (Au)	GC, GL, Pr, Str, Samp
2	Barry, J.	Corbiere, Cowie tp. (Au)	GC, GL, Pr, Str, Samp
3	Battle Mountain Canada Ltd. (Dorset Zone)	Mishibishu Lake Area (Au)	DDH – 5 (1923 m)
4	Falconbridge Ltd. (Spring Lake Property)	Rennie Tp.	GM, HLEM
5	Gerdes, J.	Keating Additional Tp, Abbie Lake Area (Au)	GM, GL, Pr, Samp, Str
6	Halverson, L.	Nameigos Tp. (Au)	Pr, Samp
7	Hutteri, H.	Chabanel Tp. (Au, Zn, Pb)	GC, Pr, Samp
8	Kakeeway, D.	Nameigos Tp. (Au)	GC, Pr, Samp, Str
9	Kennecott Canada Exploration Inc. (Whitefish Lake property)	Maness, Fiddler, Cowie, Isaac, Michano, Miskokomon tp. (diamonds)	HM, Samp
10	Kerr, W. (Pileggi West Showing)	Stover Tp. (Au, diamonds)	Lc, GL, GC, Pr, Samp
11	Korba, E.	Chabanel Tp. (Zn, Pb, Cu)	GC, Pr, Samp
12	Mealey, G. L.	Abraham Tp. (Au, base metals)	GC, Pr, Samp, Str
13	McKinnon, D	Hawkins Tp. (Au)	DDH – 1 (217 m)
14	Nicholson, T.	West, Riggs tp. (Au)	GL, Pr, Samp, Str
15	Noront Resources Ltd.	Meath, Rennie tp. (Au, Zn)	Pr, Samp
16	Patricia Mining Corporation	Finan Tp. (Au)	Samp, Str, Tr
17	Pele Mountain Resources Inc. (Markes Property)	Jacobson Tp. (Au)	Bulk, DDH-11, Samp, Str
18	Pele Mountain Resources Inc. (Vega Property)	Riggs Tp. (Au)	GC, GL
19	Porcheron, A. R.	Debassige Tp. (Au)	Pr, Samp, Str

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
20	River Gold Mines Ltd. (Vega Property)	Riggs Tp. (Au)	Bulk, Samp, Str

Falconbridge Ltd. – Spring Lake Property

During the summer, Falconbridge conducted a horizontal loop electromagnetic (HLEM) and magnetic survey over their property in Rennie Township. The property lies approximately 1 km east of the Conboy Lake Deposit. It was originally staked to cover an EM anomaly defined by Noranda in 1993 (Londry 1999).

This property is underlain by a thick sequence of massive mafic metavolcanic rocks interbedded with minor tuffaceous units. Geochemically, the mafic metavolcanics appear to have a calc-alkalic affinity. A prominent, 400 m wide felsic tuff unit strikes easterly across the property. The mafic metavolcanic rocks have been intruded by a peridotite sill in the northeastern part of the property and by a quartz-rich porphryitic intrusive stock centred on Spring Lake (Collison 1998).

Kennecott Canada Inc. – Canabrava Diamond Corporation – Whitefish Lake Property

In March, Canabrava Diamond Corporation and Paramount Ventures & Finance Inc. announced the signing of an option/joint venture agreement with Kennecott Canada Exploration Inc. to explore the company's Ontario properties for diamonds. Under the terms of the agreement, Kennecott has exclusive rights to acquire a 60% interest on all of the Canabrava and Canabrava/Paramount properties by spending $25 million within 7 years (Canabrava Diamond Corporation – Paramount Ventures & Finance Inc., *press release*, March 15, 1999).

Following a re-evaluation of Canabrava's airborne geophysical surveys, sampling and diamond-drilling program, Kennecott conducted a program of follow-up indicator mineral sampling on Canabrava's high priority targets over the Whitefish Lake project area (Canabrava Diamond Corporation – Paramount Ventures & Finance Inc., *press release*, October 12, 1999). A number of interesting ultramafic float samples were discovered during exploration and sent to Kennecott's Thunder Bay laboratory for petrographic and micro-diamond analysis. Kennecott is planning to conduct ground geophysical surveys, and possibly further airborne geophysical surveys to further refine the airborne geophysical anomalies identified by Canabrava. This work, as well as additional diamond drilling is scheduled for early 2000 (Canabrava Diamond Corporation – Paramount Ventures and Finance Inc., *press release*, December 16, 1999).

PROPERTY EXAMINATIONS

Markes Property

Location and Regional Geology

The Markes property is located in central Jacobson Township approximately 60 km due north of Wawa and approximately 15 kilometres east of the town of Dubreuilville. The main zone is situated approximately 1.5 km west of the east end of Godin Lake. It lies adjacent to the past-producing Cline Gold Mine and the producing Edwards Mine. The property is accessible by all weather road from the Edwards Mine and is presently owned by

Pele Mountain Resources Inc. who bulk sampled the prospect this year. When the Cline Development Corporation held the property, it was known as the Cline-Chubb option.

Regionally, the Goudreau – Lochalsh district consists of a combination of the Wawa Assemblage (2.75 Ga) and the Catfish Assemblage (2.70 Ga). The older assemblage consists of a lower unit of massive to pillowed, Mg- to Fe-tholeiitic, mafic metavolcanic rocks that grades upward into overlying calc-alkalic intermediate to felsic metavolcanic rocks. The intermediate to felsic metavolcanic rocks consist of tuffs, crystal tuffs, lapilli tuffs and breccias. The assemblage is capped by pyrite-bearing iron formation locally known as the Goudreau Iron Range. Unconformably overlying the iron formation is the Catfish Assemblage. It consists of a series of pillowed, massive and schistose, mafic to intermediate metavolcanic rocks and minor interbeds of mafic pyroclastic rocks. Along the northern margin of the supracrustal sequence is a well-developed sequence of argillite, siltone, wacke, subarkose and conglomerate. The conglomeratic unit is locally referred to as the Doré conglomerates. The metavolcanic rocks are locally intruded by a number of granodiorite to trondhjemitic stocks. Multiple quartz-feldspar and feldspar porphyry dikes occur throughout the district. All units are crosscut by northwest- and northeast-trending diabase dikes (Sage 1994).

Structurally, the property lies within the eastern domain of the Goudreau Lake Deformation Zone (GLDZ). The GLDZ is up to 4.5 km in width, greater than 25 km in length and strikes from 070° to 090°. In the Goudreau – Lochalsh area, it is coincident with the contact between the Wawa and Catfish assemblages, although to the west and east, the GLDZ is located within the Catfish Assemblage. High strain zones, as well as quartz-tourmaline and/or Fe-carbonate veins, are dominantly parallel, or are found at low angles (10°-25°) to the regional foliation (Heather and Arias 1992).

Property Geology

Massive to pillowed mafic metavolcanic rocks dominate the geology at the occurrence. Individual pillows are locally vesicular, rarely variolitic and range in size from 30 to 100 cm. Pillows face north and dip steeply to the north. These rocks are weakly to moderately carbonatized, with an increase in intensity adjacent to the shear zone. Outside the main shear, primary volcanic textures are preserved and pillows show little evidence of strain.

North of the shear zone an intermediate to felsic dike crosscuts and clearly truncates pillowed mafic metavolcanic rocks. The dike is non-porphyritic, tan to white weathering and weakly to strongly foliated. Non-deformed samples of this dike have been described by Hall (1987) as being fine-grained, siliceous, quartz-sericite-chlorite schist. Hall also described more deformed examples of the dike as calcite-bearing sericite schists with rare chlorite.

This intermediate dike is, in turn, intruded by narrow (<2m), quartz-phyric porphyry dikes that display sheared and folded contacts with surrounding rock types. Texturally, these dikes range from moderately foliated to massive. These latter dikes are confined to the eastern portion of the main mineralized zone.

Two narrow (<1m) northwest-trending, sub-vertically dipping felsic dikes crosscut the showing. The northernmost dike lies outside the main shear zone, is non-porphyritic and moderately hematized. The southernmost dike lies within the shear zone and has undergone extensive shearing and alteration. Despite extensive deformation, the southernmost dike has retained a northwest orientation.

Elsewhere on the property, banded iron formation occurs intercalated within both the mafic and felsic metavolcanic rocks. Typically, they contain 2-10% pyrrhotite with accessory pyrite, chalcopyrite, magnetite and sphalerite (Hall 1987). Immediately north of the showing, massive pyrrhotite occurs in deformed iron formation. Narrow, massive iron sulphide intersections have been noted in drill holes by several different geologists.

Mafic intrusive rocks are found immediately south of the shear zone and form the hanging wall of the occurrence for at least 150m to the north. The sills are typically medium-grained and have been mapped as quartz gabbros (Sage 1990). They are locally quartz-phyric and contain abundant coarse magnetite. These rocks tend to be weakly foliated to massive, but their margins are typically well foliated and locally strongly sheared. Hall (1987) has

suggested that this mafic sill acted more competently than the surrounding mafic metavolcanic rocks and affected the localization of the Markes shear zone.

The rocks have undergone regional greenshist-facies metamorphism. Silicification and Fe-carbonatization are the most prominent alteration types observed, although sericitization and pyritization are locally prominent.

The property geology is dominated by an east-trending brittle-ductile shear zone that is locally referred to as the Markes Shear. The shear ranges in width from 3 to 40 m and is traceable along strike for approximately 100 m. It consists of a series of numerous, discrete shears which cut all rock types and range from 1 to 2 cm in width.

Both the northern and southern boundaries of the Markes Shear are defined by narrow (1-2 cm), quartz-tourmaline filled shears which reportedly carry the best gold assays. Diamond drilling to the east of the main zone indicates that gold mineralization is associated with intense sericitization, silicification and pyritization within narrow quartz veinlets.

Chip samples collected by Pele Mountain Resources in 1996 averaged 8.76 g/t gold over a width of 2.84 m. The bulk sample completed this fall had an average grade of 4.9 g/t gold.

In 1986, Noranda Exploration Company Ltd., completed a diamond-drilling program on the Cline Lake property which lies immediately adjacent to the western boundary of Pele Mountain's land holdings. Approximately 1.7 km west and immediately on strike with the Markes property, Noranda drilled a sheared and altered zone (Main Zone) of quartz eye porphyry. This may be the westward extension of the Markes property.

Centennial Stock – Centennial and Norwalk Mines

Location and Regional Geology

The past producing Centennial and Norwalk mines are easily accessible by driving east from Highway 17 along the Scott High Falls road for a distance of approximately 8 km. The Centennial Mine (also known as the Kitchigami Mine) is located on the eastern side of the Centennial stock approximately 150 m north of Scott High Falls road. The Norwalk Mine (also known as the Manxman Prospect) is located on the western side of the stock, about 3.5 km west of the Centennial Mine. The Norwalk is located approximately 250 metres north of the Scott High Falls road. The Centennial Stock occupies 7 km^2 of the northwest corner of Naveau Townships and a portion of the southeast corner of McMurray Township.

The supracrustal rocks in the Michipicoten River area form part of the Wawa Assemblage (2.75 Ga). They consist of a sequence of massive and pillowed, Mg- and Fe-tholeiitic mafic metavolcanic rocks overlain by mafic breccia, tuff and chloritic shist. Intermediate to felsic metavolcanic rocks (flows, tuff, crystal tuff, lapilli tuff and breccia) are frequently interbedded with the mafic metavolcanic rocks. A thicker sequence of intermediate to felsic flows, tuff, crystal tuff, lapilli tuff and breccia overlie the mafic metavolcanic rocks in the area between Scott High Falls and the northern boundaries of Rabazo and Naveau townships. The Centennial stock is one of three felsic bodies that locally intrude the supracrustal sequence (Massey et al. 1983).

The Centennial stock hosts two minor past-producing gold mines: the Norwalk Mine produced 60 ounces of gold (1904 and 1910) and the Centennial Mine produced 510 ounces of gold and 30 ounces of silver from 8612 tons of ore (1939) (Ferguson et al. 1971). Both mines were shallow operations, with their deepest drifts at 200 and 250 feet respectively.

Property Geology

The Centennial Stock is a fine- to medium-grained, grey to white, granodiorite to trondhjemite. Its most prominent feature is the presence of bluish, opalescent quartz eyes (<10%) that are up to 3 mm in diameter. Small xenoliths

(up to 0.5 m) of mafic metavolcanic rocks are common, but not abundant. No xenoliths of felsic metavolcanic rocks have been recognized in any part of the stock (Massey 1985).

Approximately 75 m south of the Norwalk Mine shaft, a quartz-feldspar porphyry intrusion occurs marginal to the stock. The porphyry is fine-grained and contains rounded quartz phenocrysts (<5mm). The contact between the porphyry and the granodiorite is gradational. This quartz porphyry was not observed on surface at the Centennial Mine property. Diamond drilling on the Centennial property in 1985 by First Canadian Energy Corporation and Sault Meadows Energy Corporation did however, intersect a 5 m wide feldspar porphyry dike at depth (Sears 1986). This may be the same phase observed on surface at the Norwalk.

Diamond drilling programs conducted on both the Centennial Mine and Norwalk Mine properties have repeatedly intersected multiple lamprophyre dikes at depth within the Centennial Stock. The lamprophyre dikes range in width from 0.3 m to 12 m and reportedly crosscut the gold-bearing quartz veins. Usually the lamprophyre dikes are poorly described in diamond drill logs, however, drill logs from diamond drilling conducted by B. Carleton in approximately 1963, describe multiple, narrow (1 m or less) lamprophyre dikes with well developed glaucophane at one or both contacts with the granite. This development of alkali amphibole has been interpreted by Sage (1994) to be analogous to fenitization, which is associated with alkaline metasomatism related to carbonatite emplacement. It is possible that these multiple injections of lamprophyre are related to the intrusion of the nearby Firesand Creek Carbonatite.

Sinclair et al. (1937) reported that in 1936, most of the underground work completed by L. B. United Mines Limited at the Centennial Mine was conducted on the lamprophyre dikes. It was suggested that the company had encountered commercial values of platinum-group metals and was further investigating the possible relationships between the dikes and the assay values.

Mineralization at the Centennial and the Norwalk mines occurs within narrow quartz veins within the granodiorite. At the Centennial Mine, four quartz veins are exposed. These veins range in width from 0.6 m to 2.1 m. The main Centennial Vein can be traced for 350 m along strike. The veins strike from 090° to 126° and dip from 030° to 070° northeast. Contacts between the quartz veins and the host granodiorite are moderately foliated. Pyrite, pyrrhotite and chalcopyrite are the most common sulphide minerals present. Tourmaline is commonly observed as needles within the quartz veins. Locally, visible gold can be observed, associated for the most part with pyrite, chalcopyrite and tourmaline. Spectacular gold samples have been collected from this site. On average, values consistently range from 0.01 ounce per ton gold to 0.04 ounce per ton gold. Assays from grab samples have returned values up to 6.44 ounces per ton gold.

At the Norwalk Mine, the main Norwalk Vein strikes 080° and dips steeply to the south. The vein ranges in width from 0.3 – 1.5 m, and has been traced along strike for over 40 m. The vein is composed of quartz, pyrite and arsenopyrite. Visible gold has been observed within the vein. No published assays have been reported for the vein. Samples collected by the author have returned negligible gold values.

Prospecting by Cameron in 1992 in the area between the two mines revealed quartz veins in three different locations that occupy structures trending 135°, 075° - 100° and 040° - 050°. These narrow (<25 cm) veins dip steeply both north and south. None of these veins have been extensively traced along strike. Although visible gold was observed in at least one vein, the overall assay results from the veins were disappointing.

A series of discrete, narrow shears strike southeast (140°) across the stock. The 10 cm wide shears are zones of intensively foliated, black cataclastic rock. Where observed at the Centennial Mine, they are spaced approximately 100 m apart and have strike lengths of several hundred metres. This shear zone, the Road Shear or Monk Deformation Zone, can be traced for a distance of approximately 1.6 km west of the Centennial Mine. To the east, it terminates against the north-northeast-trending Firesand River Fault located adjacent to the Centennial Mine property.

There are similarities between the geology and mineralization observed at the Centennial and Norwalk mines and the past-producing Magino Mine in Finan Township. Mineralization at the Magino Mine is hosted by the trondhjemitic Webb Lake stock. The stock has undergone extensive deformation and metasomatic alteration. Gold mineralization occurs in narrow quartz veins (<1 cm to 20 cm wide) and zones of silicification up to 3 m in width. Gold is found within the veins and altered wall rocks, with the best gold values occurring within the quartz veins (Heather and Arias 1992). The major difference between the two sites is the absence of significant alteration adjacent to the quartz vein systems or within the felsic stock in the Michipicoten River area.

RECOMMENDATIONS FOR EXPLORATION

Gold and Diamonds in the Missanabie – Renabie Area

The past-producing Renabie gold mine lies at the eastern end of the Michipicoten greenstone belt. Over the course of it's operating history (1947 – 1991) the mine produced 1.1 million ounces of gold. There is still a reserve of approximately 1 million tonnes @ 0.2 g/t gold at the site.

The Renabie ore body is situated within tonalitic to trondhjemitic rocks of the Missanabie Batholith, contiguous to the eastern end of the Michipicoten greenstone belt. Gold mineralization is associated with disseminated to massive pyrite, with accessory amounts of galena, molybdenite and chalcopyrite within quartz veins in trondhjemite. The best sulphide concentrations are generally found at the margins of strongly deformed quartz veins, or in the noses of folded quartz veins. Not all quartz veins or zones of sulphide mineralization contain economic gold grades. Three distinct high-strain zones cut the west end of the Renabie batholith. The Renabie ore body is hosted within a 110° shear zone that Heather (1989) has observed to overprint and deform rocks lying within the 140° and 080° shear zones. The ore body comprises a series of subparallel, mineralized quartz veins which together possess a grossly lenticular, pipe-like geometry, plunging west-southwest at 045°.

At least three types of lamprophyric or mafic dikes have been observed in the Renabie area. All of the dikes have been complexly deformed and altered, making positive geochemical assessment difficult. The earliest type of dike is thought to be lamprophyric. They are considered to be pre- or syn-deformational, and consist of schistose biotite ± chlorite and Fe-carbonate. The second generation of lamprophyre dikes locally intrude and include fragments of the first set, as well as other wall rocks. These dikes too are pre- or syn-deformational and are strongly schistose in appearance. Within the granitic rocks, these dikes are typically strongly deformed and commonly spatially related to gold mineralized zones. A later, third set of biotite lamprophyre dikes crosscuts all deformation fabrics and gold-bearing quartz veins (Heather 1989). Similar observations regarding lamprophyre dikes were made by Bennett (1968) in the Stover, Brackin, Marsh and Lang township area to the south of the Renabie Mine. Mapping by Riley (1971) failed to identify any lamprophyre dikes in the Glasgow, Meath and Rennie township areas.

Within the last two years, prospectors working in both Stover and Meath townships have investigated the relationships between gold mineralization and deformation zones (McKewen Lake Deformation Zone) at the east end of the Michipicoten greenstone belt. Freewest Resources Canada Inc. investigated gold and base metal mineralization on the NG property in 1998. Mineralization on this property, discovered by Terry Nicholson and Gus Gratton, consists of narrow (<1 m) gold-bearing quartz veins that have strike lengths of less than 15 m. These veins contain few sulphides but frequently show fine native gold. Sampling by Freewest identified significant gold values from grab samples in at least three veins. Values include 10. 6 g/t gold from the Veronica Vein, 33.0 g/t gold in the vicinity of an old Orequest trench and 1.3 g/t gold from a vein in an undisclosed location (Fekete and Castonguay 1998). These veins lie within the McKewen Lake Deformation Zone and display a 105° to 120° orientation. In 1999, Terry Nicholson continued to prospect within the area and has uncovered several other quartz veins with spectacular examples of native gold. No details as to the structural orientations of these discoveries was available at the time of writing.

W. Kerr spent the last two years investigating the Pileggi West showing and surrounding area in Stover Township. Geological mapping has shown that gold mineralization occurs within narrow quartz stringers and veins within a sheared intermediate metavolcanic rock. Assay values from channel samples collected on this showing range from 0.08 g/t gold to 103.13 g/t gold. A compilation of the assays by Kerr (1999) indicates a weighted average of 1.03 ounces per ton gold over an average width of 0.9 m and a length of 21.0 m. Kerr also resampled some diamond drill core that had been drilled by Dome Exploration (Canada) Limited on the property in 1983. The Dome drill logs identified three intersections of kimberlitic rock at 362.8 ft., 431.9 ft. and 771.7 ft. The rock was described by Dome to be medium-grained, dark grey green and containing phenocrysts of olivine and phlogopite. Subsequent investigation by Kerr suggests that these intersections are lamprophyre, however, no substantive geochemical analysis has been conducted on the material.

It is recommended that prospectors continue to investigate the gold bearing potential of the McKewen Lake Deformation Zone in north central West Township and in western Stover Township. Further investigation of the gold-bearing potential of the Baltimore Lake Deformation Zone in central Stover Township also is advised. The diamond potential of the area cannot be overlooked. Investigation of a selection of diamond drill records for the Missinabie – Renabie area reveal the presence of abundant lamprophyre dikes. If samples of this core can be retrieved, a resampling and petrographic program is warranted.

OGS ACTIVITIES AND RESEARCH BY OTHERS

A helicopter-supported regional lake sediment and water geochemical survey of the Mishibishu Lake greenstone belt was conducted by staff from Sedimentary Geoscience Section of the Ontario Geological Survey during the summer. The project was conducted as a means to provide a geochemical database to assist in the exploration of an area with high mineral potential. Preliminary results of this survey are outlined by Jackson and Hamilton (1999).

Dan Russell, undergraduate student at McMaster University, is conducting research on the Coldwater Creek kimberlitic dike in Lendrum Township. This research will provide the basis of his honours BSc thesis.

ACKNOWLEDGEMENTS

P. M. Morra kindly prepared Figure 1. P. J. Hope compiled information for Table 3.

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Table 5. Mineral deposits not being mined in the Wawa Area in 1999.

Abbreviations

AF ..... Assessment Files
CMH ..... Canadian Mines Handbook
GR ..... Geological Report
MDC ..... Mineral Deposit Circular
MDIR ..... Mineral Deposit Inventory record
MLS ..... Mining Lands, Sudbury
MR ..... Mining Recorder
NM ..... The Northern Miner
OFR ..... Open File Report
PC ..... Personal Communication

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Alden-Goudreau (past producer) Cowie Township	Au	170 000 tons @ 0.50 oz/t Au	Algoma Central Railway	CMH 1937-43	Inactive
Braminco Prospect Brackin Township	Au	100 000 T @0.15 opT (#21 Vein); 23 000 T @ 0.31 opT (#7 Vein); 5000 T @ 0.26 opT (B Vein)	Conquest Yellowknife Resources Ltd.	RGF	Inactive
Cline – Pick Gold Mine (past producer) Jacobson Township	Au	20 000 tons @ 19.5 g/t Au in No. 3 shaft area	Cline Development Corporation.	RGF	Inactive
Ego Mines Claims Abotossaway Township	Au, Cu	7 mineralized zones; W-8 zone hosts 442 080 tonnes @ 2.6 g/t Au, 1.91% Cu	N. A.	OFR 5587	Inactive
Goudreau Zone Finan Township	Au	198 000 tonnes @ 8.4 g/t Au	Patricia Mining Corporation	RGF	Active exploration 1997
Kremzar Mine (past producer) Finan Township	Au	229 777 tonnes @ 7.65 g/t Au	Patricia Mining Corporation	RGF	Active exploration 1997
Lakemount Property Esquega Townships	Ni, Cu	2 500 000 tons @ 0.55% Ni 0.36% Cu	N. A.	OFR 5798	Last active 1990
Lochalsh Deposit (Island Gold Project) Finan Township	Au	883 000 tonnes @ 6.5 g/t Au includes 148 000 tonnes @ 5.34 g/t Au (measured); 260 000 tonnes @ 6.95 g/t Au (indicated); 475 000 tonnes@ 6.61 g/t Au (inferred)	Patricia Mining Corporation	RGF	Underground ramp to 140 m
Magino Mine (past producer) Finan Township	Au	24 million tonnes @ 1.68 g/t Au. Past producer 1988-92, 101 948 oz	Golden Goose Resources Inc.	NM, Aug. 11 1997	Active. Heap leach study 1999
Magnacon Mine (past producer) Mishibishu Lake Area	Au	1.47 million tons aver. 0.19 oz/t Au (drill indicated). Past producer 1990, 19 397 oz from 163 366 tons	Golden Goose Resources Inc.	CMH, 1997-98, p. 204	Inactive
Markes Occurrence Jacobson Township	Au	65 000 tonnes @ 5.75 g/t Au	Pele Mountain Resources Inc.	RGF	Active. Diamond drilling 1990. Bulk

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
					sample 1999.
Mishi Main Zone Mishibishu Lake Area	Au	1 424 300 tonnes@ 4.24 g/t Au; open pittable reserve 772 000 tonnes@ 3.3 g/t Au	River Gold Mines Ltd.	CMH, 1997-98, p.318-319	Active exploration 1997. Development planned 2000
Murphy-Algold-Amhers Gold Mine (past-producer) Abotossaway Township	Au	248 800 tons @ 0.305 oz/t Au	N. A.	RGF	Inactive
Nudulama Prospect Leeson Township	Au	579 325 T @ 0.194 opT Au	Conquest Yellowknife Resources Ltd.	RGF	Inactive
No. 8 Zone Finan Township	Au	90 700 tonnes @ 6.9 g/t Au	Patricia Mining Corporation	RGF	Exploration 1997
Pine Zone Finan Township	Au	70 000 tonnes @ 6.4 g/t Au	Patricia Mining Corporation	RGF	Inactive
Renabie Mine (past producer) Leeson Township	Au	1 million tonnes @0.2 g/t Au. Past producer 1,100,000 oz Au, closed 1991	N. A.	RGF	Rehabilitated
Sugar Zone Hambleton and Odlum Townships	Au	692 000 tonnes @ 6.9 g/t Au	Harte Resoureces Corporation – Corona Gold Corporation J. V.	March 23, 1999 press release	53 ddh (9957m), stripping, trenching in 1998-99
Surluga Mine (past producer) McMurray Township	Au	385 000 tons @ 0.21 opT Au. Past producer 1989, 4921 oz Au & 383 oz Ag	Citadel Gold Mines Inc.	NM, March 5, 1990	Care and maintenance

Ontario

Ontario Geological Survey
Regional Resident Geologist Program

Timmins Regional Resident Geologist (Sault Ste. Marie District)–1999

by

C. Ravnaas, M. Hailstone, B.T. Atkinson and P. Morra

2000

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TIMMINS REGIONAL RESIDENT GEOLOGIST (SAULT STE. MARIE DISTRICT) – 1999

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INTRODUCTION

Primary mineral production from the Sault Ste. Marie District this year was bedrock aggregate from 5 quarries. A total of 22 individuals and companies are known to have conducted mineral exploration and prospecting programs in the District during the year, 3 of which were funded under OPAP. Copper-precious metals mineralization hosted in Keweenawan rocks was the major focus of exploration in 1999. Gold and base metals were the target of 16 exploration projects. Gold was the primary target in 4 projects. One project targeted diamonds on a reconnaissance scale. Details on exploration activity can be found in the text and by reference to Table 1 and Figure 1.

Production of sand and gravel aggregate for the year are; 40 Licensed Pits extracting 3 000 000 tonnes and from 100 Aggregate Permits extracting 1 000 000 tonnes (Ministry of Natural Resources, Blind River, 1999). These figures do not include bedrock aggregate quarries discussed in Quarrying Activity.

QUARRYING ACTIVITY

Production continued from four established bedrock quarries with one new quarry commencing production in 1999. The quarries are keyed with letter in parentheses to Figure 1.

Ontario Trap Rock (A Division of R.W. Tomlinson Limited)

Ontario Trap Rock (A) continued quarrying a crushed bedrock aggregate from Nipissing diabase at the site 3 km east of the Town of Bruce Mines. R. W. Thomlinson Limited produces high quality aggregates for the construction industry. There are 25 people employed on a seasonal basis, with an estimate of $2,000,000 impact on the area economy (Jim Forbes , Ontario Trap Rock, personal communication, 2000).

The operating season begins in March and normally ends in November. The aggregate is transported by rail, truck and ship from their deep water port on Lake Huron. Production and sales fluctuated with market demand.

Gilbertson Enterprises Quarry

Gilberston Enterprises (B) of St. Joseph Island operates a quarry east of Highway 548 and south of the junction with Highway 17. The product is a reddish-pink granophyre used for landscaping purposes. Several sizes of products are screened for different landscaping effects. This is typical of the Bruce Mines type diabase of which the granophyre is a late differentiate. 1999 deliveries were drawn from the 1998 stockpiles (Scott Eddy, personal communication, 2000).

Nestorville Quarry

The Nestorville Quarry (C) is located near the Town of Nestorville, 4 km west of the Town of Thessalon. Crushed Nipissing diabase is used for high quality construction aggregate and roofing granules (Reg Gardner, personal communication, 2000).

Root River Sandstone Quarry

Root River Sandstone Quarry (D) operated by E. Kosiba is located within the city limits of Sault Ste Marie. The quarry produced an attractive flagstone used mostly for stone facing, retaining walls and landscaping (Ed Kosiba, personal communication, 2000).

Rancourt Quarry

The Rancourt Quarry (E) commenced operation in 1999. The quarry is located in Gould Township approximately 41 km north of the Town of Thessalon. The quarried black argillite is used in the construction of fireplaces, walkways, outdoor stairs and patios (R. Bertolo, personal communication, 2000).

EXPLORATION ACTIVITY

A summary of 1999 Exploration Activities is produced in Table 1.

Aurogin Resources Ltd.

The company has 100% interest in 153 mineral claims (761 claim units) located in Palmer, Ryan, Nicolet, Norberg, Kincaid and Wishart townships 60 km north of Sault Ste. Marie, Ontario. Mineralization is associated with quartz carbonate veins and breccia pipes of Late Keweenawan age. Dave Rogers, president of Aurogin Resources Ltd. indicates that the Batchawana area is located at a major flexure point on the Lake Superior Rift and contains numerous Late Proterozoic aged - Keweenawan breccia pipe-type diatreme intrusions (press release, Aurogin Resources Ltd., September 30, 1998).

In November and December 1998 Fort Knox Gold Resources Inc. and Aurogin Resources Ltd. completed an 8-hole diamond drill program totalling 1840 m on the Batcha Joint Venture option portion of Aurogin's Batchawana property in Nicloet Township. The drill program tested 5 new geophysical targets without encouragement. Fort Knox dropped their option May 21, 1999 and Aurogin retains a 100% interest in the Batchawana Project properties. (Aurogin Resources Ltd., Report to Shareholders, November 15, 1999).

In Palmer Township, 7 km southeast of the Batcha Joint Venture property, encouraging results were obtained from 1998 drilling on 2 breccia zones. At the Richard's Breccia diamond drill hole AR98-07 cut sulphide breccia from 36.45 m to 63.03 m averaging 1.46% copper and 3.9 gm/t silver. Keweenawan porphyry mineralization occurs in proximity to this occurrence and it is possible that this breccia overlies and roots into a fairly shallow porphyry copper-gold-silver system. At the Mountain Breccia diamond drill hole AR 98-04 cut 3 rich quartz zones in 165 m of sulphide breccia. The quartz rich zone between 235.5 and 245.15m was anomalous in gold and averaged 23.5 gm/t silver (Aurogin Resources Ltd., Report to Shareholders, November 15, 1999).

In February 1999, Aurogin Reosurces Ltd. staked 30 claim units in Thompson and Bright Townships and has applied for a licence of occupation covering a 12 km strike length of a gabbro anorthosite intrusion. (Aurogin Resources Ltd, Report to Shareholders, November 15, 1999). Aurogiun Resources Ltd. has exclusive use of AREOTEM Time-Domain EM system until Feb 28, 2002 and the company intends to survey this property as part of their NUGEN project (press release, Aurogin Resources Ltd., November 18, 1999).

Table 1. Exploration activity in the Sault Ste. Marie District in 1999.

Abbreviations

AEM ..... Airborne electromagnetic survey
AM ..... Airborne magnetic survey
DD ..... Diamond drilling
GL ..... Geological survey
GM ..... Ground magnetic survey
KIM ..... Kimberlite indicator mineral sampling
Lc ..... Linecutting
OPAP ..... Ontario Prospectors Assistance Program
Pr ..... Prospecting
Samp ..... Sampling (other than bulk)
Str ..... Stripping
Tr ..... Trenching

No.	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity (Incentive Program)
1	Aurogin Resources Ltd.	Bright, Thompson Twps. (PGE)	Pr, Samp
2	Aurogin Resources Ltd.	Nicolet, Norberg Twps. (Cu, Ag, Au)	DD, Samp
3	Barry, Rita (OPAP)	Otter Twp. (Cu, Au)	Pr, Lc, GM, Tr, Samp
4	Canabrava Diamond Corporation / Paramount Ventures and Finance Inc. & Kennecott Canada Exploration Inc.	Numerous Twp. (Diamond)	KIM, Samp
5	Dan Patrie Exploration Ltd. (OPAP)	Gapp Twp. (Zu, Cu, Au)	Lc, P, GL, Samp
6	Doran, Francis	Kincaid Twp. (Cu, Ag, Au)	Pr, Samp
7	Falconbridge Limited	Aweres, Archibald, Gaiashk, Nicolet, Norberg, Tupper Twps. (Cu, Ag, Au)	P, GL, Samp
8	Frankow, Philip	Neill, Moggy Twps. (Au, Zn, Cu)	GL, Samp, Pr
9	Freeweest Resources Canada Inc.	Gaiashk, Joubin Twps. (Au, Zn)	Pr, Samp
10	Gasparetto, Angela (OPAP)	Kincaid Twp. (Cu, Ag, Au)	Lc, Pr, GL, Samp
11	Gold Insight Resources Ltd.	Galbraith Twp. (Au)	Pr, Samp
12	Intervoice Canada Limited	Kincaid Twp. (Cu, Ag, Au)	Pr, Samp
13	Lucuik, George & Hicks, Cliff	Vankoughnet Twp. (Ag, Pb, Au)	Pr, Samp
14	O'Connor, Thomas	Kincaid, Ryan Twps. (stone)	Tr
15	Phelps Dodge Corp. Can. Ltd.	Vankoughnet Twp. (Pb, Zn, Ag, Au)	GL, Pr, Samp
16	Pipoli, Dominic & Ralph, Jim	Wishart Twp. (Au)	Str, Samp
17	Porcheron, Andre	Nicolet Twp. (Cu, Ag, Au)	Pr, Samp
18	Pruneau, Jean-Pierre	Jollineau Twp. (Ce, Li, Rb, Ta)	Pr, Samp
19	Roy, Arthur	Albanel Twp. (Cu, Ag, Au)	Pr, Samp
20	Tremblay, Mike & Robert, Jack	Moen Twp. (Au, BM)	Pr, Samp
21	Shellhorne, Ted	Thompson Twp. (Au, Cu)	Pr, Samp
22	Walmsley, John	Casson Twp. (Cu, Ag, Au)	Pr, Samp

Canabrava Diamond Corporation/Paramount Ventures and Finance Inc. and Kennecott Canada Rocky Island Lake Project

Canabrava Diamond Corporation and joint venture partner Paramount Ventures and Finance Inc. commenced an extensive reconnaissance sampling program for diamonds and diamond indicator minerals, over an area covering 130,000 square km known as the Rocky Island Lake project. The 2 companies subsequently signed an option/joint venture letter agreement with Kennecott Canada Exploration Inc. Kennecott is committed to spend $1,500,000 in 18 months before the companies shall enter into a formal joint venture agreement.

Kennecott's summer exploration program consisted of follow up indicator mineral sampling in high priority areas and addition regional reconnaissance sampling. Processing of samples is underway at Kennecott's Thunder Bay laboratory facility. Results are expected in the near future (press release, Canabrava Diamond Corporation, October 1999).

Falconbridge Limited

Falconbridge Limited carried out a regional reconnaissance investigation for Keweenawan copper-precious metal mineralization north and east of Sault Ste. Marie. The project included prospecting, sampling and geological mapping and litho-geochemical sampling. During the year Falconbridge staked 64 claim units along the border of Archibald and Tupper townships, approximately 4 kilometers northwest of the Wolfe Lake copper occurrence. Additional staking was carried out in Aweres township for a total of 23 claim units in the vicinity of the Island Lake Copper prospect. Reconnaissance geological mapping and sampling was also carried out on their 47 claim unit property in Norberg and Nicolet townships. This claim group includes the East Breccia zone initially delineated in 1962 by Tribag Mining Co. Limited (Mike Collinson, Falconbridge Limited, personal communication).

Phelps Dodge Corporation of Canada, Limited

Following staking of 10 claim units in Vankoughnet Township, Phelps Dodge carried out geological mapping, sampling and prospecting on their property this summer. This property adjoins Eagle Copper prospect located on patented land in the SW 1/4 of Section 14 Vankoughnet Township. The Eagle was developed on chalcopyrite bornite rich veins up to 3 1/2 feet wide however galena veins and gold bearing quartz veins are also reported on the property along with a graphitic unit (District Geologist Office, Assessment Files Sault Ste. Marie, M. Johnson, personal communication, 1999).

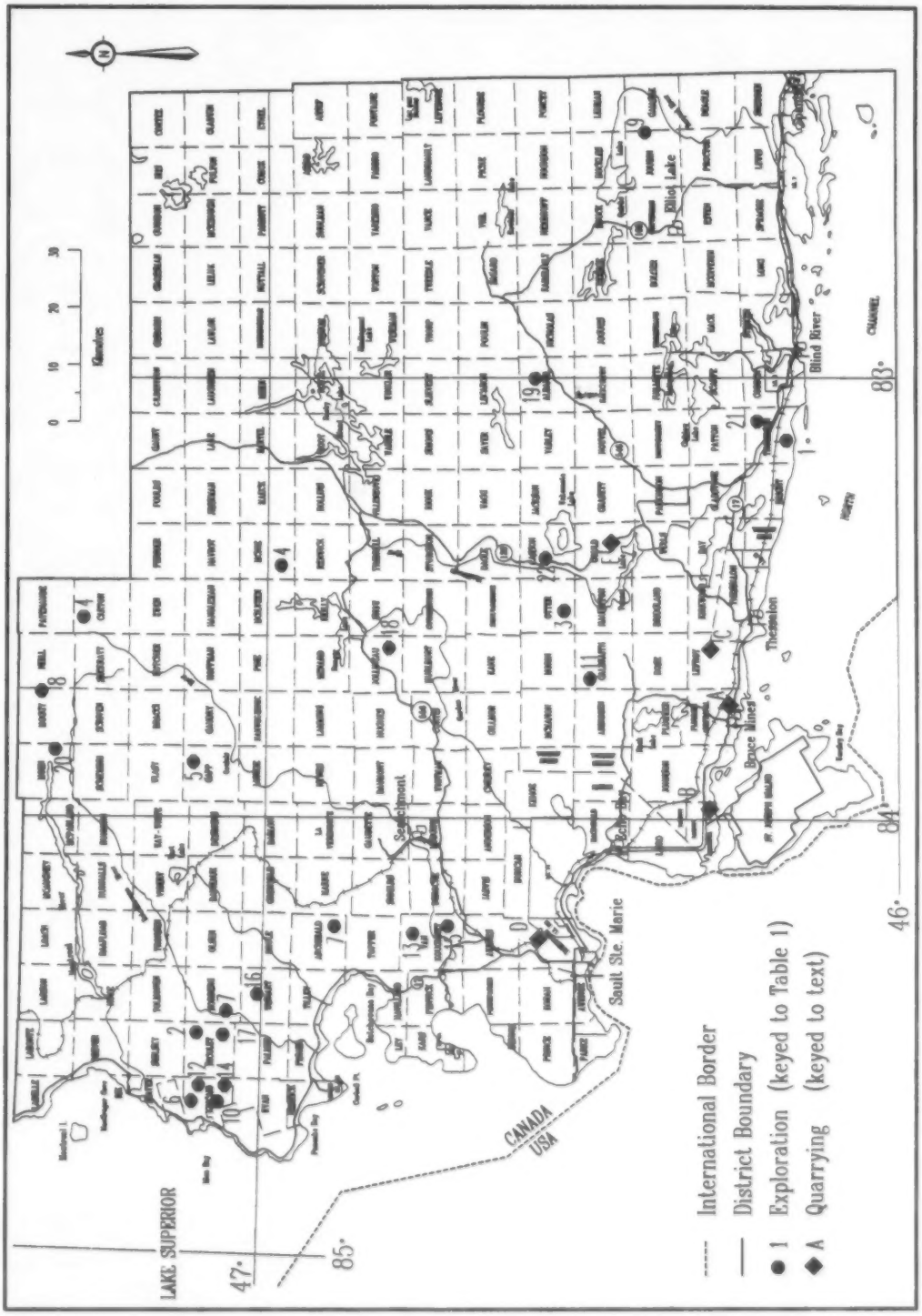

Figure 1. Exploration and quarry activity in the Sault Ste. Marie District in 1999

Table 2. Assessment files received in the Sault Ste. Marie District Office in 1999.

Abbreviations

AEM ..... Airborne electromagnetic survey
AM ..... Airborne magnetic survey
ARA ..... Airborne radiometric survey
Beep ..... Beep Mat survey
Bulk ..... Bulk sampling
DD ..... Diamond drilling
DDH ..... Diamond drill hole(s)
DGP ..... Down-hole geophysics
EnvR ..... Environmental report
GC ..... Geochemical survey
GEM ..... Ground electromagnetic survey
GL ..... Geological survey
GM ..... Ground magnetic survey
GR ..... Geological report
GRA ..... Ground radiometric survey
Grav ..... Gravity survey
HLEM ..... Horizontal loop electromagnetic survey
HM ..... Heavy mineral sampling
IM ..... Industrial mineral testing and marketing
IP ..... Induced polarization survey
Lc ..... Linecutting
Met ..... Metallurgical testing
..... Overburden drilling
ODH ..... Overburden drill hole(s)
OPAP ..... Ontario Prospectors Assistance Program
PEM ..... Pulse electromagnetic survey
PGM ..... Platinum group metals
Pr ..... Prospecting
RES ..... Resistivity survey
Samp ..... Sampling (other than bulk)
Seismic ..... Seismic survey
SP ..... Self-potential survey
Str ..... Stripping
Tr ..... Trenching
UG ..... Underground exploration/development
VLEM ..... Vertical loop electromagnetic survey
VLFEM ..... Very low frequency electromagnetic survey

Township	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Aberdeen	Algoma Ore Div.	1907	Tr, Samp	Donated	SSMP Aberdeen 08
Aberdeen Add.	Algoma Ore Div.	1908	UG	Donated	SSMP Aberdeen Add. 06
Aberdeen Add.	Algoma Ore Div.	1952	Tr, DD	Donated	SSMP Aberdeen Add. 07
Aberdeen Add.	Algoma Ore Div.	1952	DD, Samp	Donated	SSMP Aberdeen Add. 09
Aberdeen Add., Chesley Add.	Algoma Ore Div.	1962	DD, Tr	Donated	Aberdeen Add. 10
Anderson et al.	Algoma Ore Div.	1917	P, DD	Donated	Anderson 12 (dup)
Archibald	Algoma Ore Div.	1955	GM, Tr, Samp	Donated	Archibald 10 ACR
Aweres	Algoma Ore Div.	1959	Tr	Donated	SSMP Aweres 03
Aweres	Algoma Ore Div.		IP, DD,Tr, Str	Donated	SSMP Aweres 13
Bright	Algoma Ore Div.	1943	Tr, Samp	Donated	SSMP Bright 01
Casson	Julien, P.E.	1997	Tr	2.19031	SSMP Casson 10
Chesley Add.	Algoma Ore Div.	1952	Tr	Donated	SSMP Chesley 01
Dablon	Algoma Ore Div.	1939	Samp	Donated	SSMP Dablon 01
Dagle	Algoma Ore Div.	1967	Samp, Tr, GEM, GL	Donated	SSMP Dagle 04
Daumont	Algoma Ore Div.	1918	Str, Tr	Donated	SSMP Daumont 02

Township	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Daumont	Algoma Ore Div.	1926	Samp, Str	Donated	SSMP Daumont 03
Daumont	Algoma Ore Div.	1927	Samp, Str, DD	Donated	SSMP Daumont 03
Davieaux	Algoma Ore Div.	1915	Samp	Donated	SSMP Davieaux 03
Davieaux	Algoma Ore Div.	1918	Str	Donated	SSMP Davieaux 03
Davieaux	Algoma Ore Div.		Samp	Donated	SSMP Davieaux 04
Deroche	Algoma Ore Div.	1909	Tr	Donated	SSMP Deroche 06
Deroche	Algoma Ore Div.	1910	Str, Tr	Donated	SSMP Deroche 01
Deroche	Algoma Ore Div.	1911	Tr, DD	Donated	SSMP Deroche 04
Deroche	Algoma Ore Div.	1922	Tr	Donated	SSMP Deroche 02
Deroche	Algoma Ore Div.	1920	DD	Donated	SSMP Deroche 03
Deroche	Algoma Ore Div.	1931	Tr, Samp	Donated	SSMP Deroche 07
Deroche	Algoma Ore Div.	1981	Samp, GL	Donated	SSMP Deroche 06
Deroche, Shields	Algoma Ore Div.	1911	Tr, Samp	Donated	SSMP Sheilds 01
Fenwick	Algoma Ore Div.	1954	Samp	Donated	SSMP Fenwick 11
Gaudette	Algoma Ore Div.	1963	GM	Donated	SSMP Gaudette 01
Gaudry	Algoma Ore Div.		Str, Samp	Donated	Gaudry 10-C1
Gaunt	Algoma Ore Div.	1953	GL	Donated	SSMP Gaunt 01
Gladstone	Algoma Ore Div.	1947	Samp	Donated	SSMP Gladstone 03
Gould, Grassett	Algoma Ore Div.	1928	Samp	Donated	SSMP Gould 09
Grassett	Algoma Ore Div.	1967	Samp, Tr	Donated	SSMP Grassett 01
Gunterman	Algoma Ore Div.	1953	Samp, DD, Tr	Donated	SSMP Gunterman 05
Handleman, Hoffman	Algoma Ore Div.	1964	GM, Samp, Tr	Donated	SSM Handleman 10
Hembruff, Raimbault	Algoma Ore Div.	1921	Samp	Donated	Hembruff 10-E1
Herrick	Algoma Ore Div.	1947	Tr	Donated	SSMP Herrick 01
Hodgins	Algoma Ore Div.	1947	Tr	Donated	SSMP Hodgins 04
Hodgins	Ed Easebig Prospect	1979	Tr, Samp	Donated	SSMP Hodgins 04
Hughes	Fleming, Dennis	1991	Str, Tr	OP91-551	SSMP Hughes 01
Johnson	Algoma Ore Div.	1927	Tr, Samp	Donated	SSMP Johnson 04
Johnson	Algoma Ore Div.	1952	DD, Samp	Donated	SSMP Johnson 02
Johnson, Rose et al.	Algoma Ore Div.		AEM	Donated	SSMP Aberdeen Add. 08

Township	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Jollineau	Algoma Ore Div.	1966	DD	Donated	SSM Jollineau 12
Kincaid	Algoma Ore Div.	1947		Donated	SSMP Kincaid 12
Korah	Algoma Ore Div.	1952	Tr	Donated	SSMP Korah 01
Korah	Algoma Ore Div.	1972	Samp	Donated	SSMP Korah 02
Labelle	Algoma Ore Div.	1912	DD, Tr	Donated	SSMP Labelle 01
Laird	Algoma Ore Div.	1911	Tr	Donated	SSMP Laird 02
Laird	Algoma Ore Div.	1912	Tr, Samp	Donated	SSMP Laird 04
La Verendrye	Algoma Ore Div.	1953	Samp	Donated	SSMP La Lerendrye 01
Ley	Algoma Ore Div.	1946	Samp, Tr	Donated	SSMP Ley 01
Long	Algoma Ore Div.	1907	Tr, Samp	Donated	SSMP Long 04
Long	Algoma Ore Div.	1953	Str, Tr, GM	Donated	SSMP Long 02
Long	Algoma Ore Div.		Samp	Donated	SSMP Long 03
Lunkie	Fleming, Dennis	1997	Str, Samp, P	OP97-132	SSMP Lunkie 07
MacDonald	Algoma Ore Div.	1908	Samp, P	Donated	SSMP MacDonald 02
MacDonald	Algoma Ore Div.	1952	Tr	Donated	SSMP MacDonald 01
Maeck	Algoma Ore Div.	1955	Tr, Str, Samp	Donated	Maeck 13-B1
Marne	Algoma Ore Div.	1972		Donated	SSMP Marne
McAughey, McParland	Algoma Ore Div.	1960	GM, GL, Str	Donated	McAughey 10-A1 ACR
Meredith	Algoma Ore Div.	1918	DDH	Donated	SSMP Meredith 01
Neill	Algoma Ore Div.	1984	GC, Str	Donated	SSMP Neill 02
Neill	Frankow, Phillip	1999	GL	2.19749	SSMP Neill 18
Nicholas, Albanel	Algoma Ore Div.	1911	Samp	Donated	SSMP Nicholas 01
Nicolet	Algoma Ore Div.	1866	Samp	Donated	SSMP Nicolet 06
Nicolet, Palmer	Algoma Ore Div.	1956	GM, Samp	Donated	SSMP Nicolet 07
Norberg, Nicolet	Algoma Ore Div.	1963	GM, Samp, DD, IP, Tr	Donated	SSMP Nicolet 05
Norberg	Algoma Ore Div.	1960	GL, GM	Donated	Norberg 17
Nouvel	Algoma Ore Div.	1929	Tr, Samp	Donated	SSMP Nouvel 01
Olsen	Fleming, Trevor	1997	P,Tr, Samp	OP97-188	SSMP Olsen 41
Otter	Berry, Rita	1998	Samp, Tr	2.19148	SSMP Otter 09
Otter	Barry, Rita	1999	VLFEM, GM	2.19867	SSMP Otter 10

Township	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Otter	Barry, Rita	1999	Tr, Samp	2.19868	SSMP Otter 11
Palmer	Algoma Ore Div.	1952	Tr	Donated	SSMP Palmer 27
Palmer	Aurogin Resources Ltd.	1997	IP, Lc, GL	2.19146	SSMP Palmer 26
Palmer	Hepditch, Lawerence	1998	GC, P	2.18861	SSMP Palmer 24
Palmer	Leahy, Paul	1997	GL, P	2.19573	SSMP Palmer 31
Palmer et al.	Roy J. Rupert & Associates	1997	IP, DD, P	Donated	SSMP Palmer 25
Palmer, Ryan	Algoma Ore Div.	1962	DD, Samp	Donated	SSMP Palmer 29
Palmer, Ryan	Algoma Ore Div.	1973	DDH	Donated	SSMP Ryan 09
Palmer, Ryan, Kincaid	Algoma Ore Div.	1953	DD, Samp	Donated	SSMP Palmer 28
Palmer, Ryan, Nicolet	Aurgoin Resources Ltd.	1998	DD, Samp	2.19177	SSMP Palmer 30
Parisienne Island	Algoma Ore Div.	1921	Samp	Donated	SSMP Parisienne Is
Plummer	Algoma Ore Div.	1960	DD	Donated	SSMP Plummer 08
Plummer Add.	Algoma Ore Div.	1947	DD	Donated	SSMP Plummer 07
Plummer Add.	Algoma Ore Div.	1947	Tr, Samp	Donated	SSMP Plummer Add. 07
Plummer Add.	Algoma Ore Div.	1952	Samp	Donated	SSMP Plummer Add. 08
Poulin	Algoma Ore Div.	1942	Samp	Donated	SSMP Poulin 01
Poulin	Algoma Ore Div.	1952	Samp	Donated	SSMP Poulin 01
Prince	Algoma Ore Div.	1963	GM	Donated	SSMP Prince 01
Proctor	Algoma Ore Div.	1964	Lc, GM	Donated	SSMP Proctor 02
Raimbault	Algoma Ore Div.	1921	Samp	Donated	SSMP Raimbault 06
Renwick, Timbrell et al.	Algoma Ore Div.	1911	P	Donated	SMP Renwick 01
Rose	Algoma Ore Div.	1933	Str, Samp	Donated	SSMP Rose 01
Runnalls	Algoma Ore Div.	1960	GL, GM	Donated	Runnals 18-A1
Ryan	Algoma Ore Div.	1947	UG	Donated	SSMP Ryan 05
Ryan	Algoma Ore Div.	1947	Tr, DD	Donated	SSMP Ryan 09
Ryan	Algoma Ore Div.	1947	DD, UG, Tr	Donated	SSMP Ryan 07
Ryan	Algoma Ore Div.	1960	GM	Donated	SSMP Ryan 10
Ryan, Palmer	Algoma Ore Div.	1952	DD	Donated	SSMP Ryan 06
Ryan, Palmer	Pancake Enterprises	1972	DD, Samp, Tr	Donated	SSMP Ryan 11

SAULT STE. MARIE DISTRICT – 1999

Township	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Shedden	Algoma Ore Div.		UG	Donated	SSMP Shedden 01
Smilsky	Algoma Ore Div.	1949	GL	Donated	SSMP Smilsky 03
Smilsky, Peever	Algoma Ore Div.	1949	Str, Tr	Donated	SSMP Smilsky 02
Smilsky, Tolmonen	Algoma Ore Div.	1964	Samp	Donated	SSMP Smilsky 04
Smilsky, Kincaid, Rix	Algoma Ore Div.	1949	GL	Donated	SSMP Smilsky 03
St. Joseph	Algoma Ore Div.	1927	Samp	Donated	SSMP St .Joseph 01
St. Joseph	Algoma Ore Div.	1941	Samp	Donated	SSMP St. Joseph 02
Striker	Algoma Ore Div.	1955	DD	Donated	SSMP Striker 01
Sturgeon	Douglas, H.W.	1997	HLEM	2.19610	SSMP Sturgeon 01
Sturgeon	Douglas, H.W.	1998	DD	2.19627	SSMP Sturgeon 02
Tarbutt	Algoma Ore Div.	1927	Tr, Samp	Donated	SSMP Tarbutt 01
Tarbutt	Algoma Ore Div.		Samp	Donated	SSMP Tarbutt 02
Tarentorus	Algoma Ore Div.	1960	Samp, Tr	Donated	SSMP Tarentorus 03
Tilley	Algoma Ore Div.	1947	Tr,UG	Donated	SSMP Tilley
Tronsen	Algoma Ore Div.	1960	GEM	Donated	Tronsen 10 ACR
Tronsen	Algoma Ore Div.	1960	GEM, GM	Donated	SSMP Tronsen 01
Tronsen	Algoma Ore Div.	1960	GEM	Donated	SSMP Tronsen 02
Tronsen	Algoma Ore Div.	1960	Lc, GM	Donated	SSMP Tronsen 03
Tupper	Algoma Ore Div.	1956	DD, Samp	Donated	SSMP Tupper 02
Tupper	Algoma Ore Div.	1956	Tr, DD, Samp	Donated	Tupper 13
Tweedle	Algoma Ore Div.	1953		Donated	SSMP Tweedle 01
Vankoughnet	Algoma Ore Div.	1913	P	Donated	SSMP Vankoughnet 09
Vankoughnet	Algoma Ore Div.	1942	DD, Str	Donated	SSMP Vankoughnet 12
Vankoughnet	Algoma Ore Div.	1961	Str, Tr	Donated	SSMP Vankoughnet 08
Vankoughnet	Algoma Ore Div.	1972	Lc, GEM, GL, GC, DD	Donated	SSMP Vankoughnet 14
Vankoughnet	Algoma Ore Div.	1981	DDH	Donated	SSMP Vankoughnet10
Vankoughnet	Hicks, C.	1997	DD, Samp, Tr, GC	OP97-293	SSMP Vankoughnet 06
Vankoughnet	Prace Deposit	1976	Samp, DD, Tr	Donated	SSMP Vankoughnet 11
Varley	Algoma Ore Div.	1946	DD	Donated	SSMP Varley 06
Vibert	Algoma Ore Div.	1942	Samp	Donated	SSMP Vibert 05

Township	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
Vibert	Algoma Ore Div.	1955	GM, Samp	Donated	Vibert 12-B1 ACR
Villenuve	Algoma Ore Div.	1960	Samp, GM	Donated	SSMP Villenuve
Wishart	Algoma Ore Div.	1963	Samp, P, Str	Donated	SSMP Wishart 09
Wlasy	Algoma Ore Div.	1966	DD	Donated	SSMP Wlasy 02
Wlasy	Algoma Ore Div.	1967	Lc, DD	Donated	SSMP Wlasy 01

LAND USE PLANNING ACTIVITY

Staff of the Sault Ste. Marie District Geologist Office provided input to the Ontario Living Legacy review process. There are a total of 107 candidate park and Conservation Reserve sites within the Sault Ste. Marie District with 8 of these sites to be regulated early in 2000. The Mineral Resource Assessments for these sites are kept on file at the Sault Ste. Marie District Geologist Office.

During the year the Sault Ste. Marie District Geologist provided additional comments on the Official Plans for the municipalities of Sault North, Echo Bay- Desbarats, St Joseph Island and Blind River & Suburban. Copies of maps and reports for Official Plans of municipalities within the District are kept on file at the Sault Ste. Marie District Geologist Office.

In June the Elliot Lake Research Field Station prepared 12 draft Lake Management Plans for the Elliot Lake Waterfront Development Committee. These were reviewed by staff in August and followed up with a visit to the Elliot Lake Research Field Station in October to discuss the initial review of the drafts. On November 20, draft Lake Management Plans were forwarded for review. The results of this review will be submitted by February 1, 2000. Copies of these Lake Management Plans will be kept on file for viewing at the Sault Ste. Marie District Geologist's Office.

SAULT STE. MARIE DISTRICT STAFF AND ACTIVITIES

The Sault Ste. Marie office was staffed by M. Hailstone, District Geologist, C. Ravnaas, Acting District Geologist and P. Morra, District Support Geologist. Assistance was povided by Jason Martineau, Co-op student from White Pines High school, between March and June and again as an experience student between June and August. Jeremy Smith also assisted as an experience student during July and August. During the past year Paui Beach was engaged under contract to update the MDI database.

M. Hailstone accepted the Training and Development position of Regional Land Use Geologist in Sudbury in October 1999. C. Ravnaas accepted The Training and Development position of Sault Ste. Marie District Geologist in October 1999. M. Hailstone and C. Ravnaas continued as part of the Economic Development Team.

M. Hailstone participated in a week long Economic Development Course offered through Waterloo University in April. Staff of the District Geologist Office carried out 23 field visits during the year tabulated in Table 3. Office staff provided 4 field trips to the area for research groups and industry including 3 days spent with Dr Takashi Murakami and 6 post graduate students from the university of Tokyo, examining and sampling paleosols in Lower Huronian stratigraphy between Sault Ste Marie and Elliot Lake.

Algoma Ore Division donated 125 assessment files to the Sault Ste. Marie District Geologist Office. The assessment files were processed and filed by respective township as documented in Table 2.

M. Hailstone and C. Ravnaas attended the Prospectors and Developers of Canada Convention in Toronto in March, manning the Northwestern and Northeastern Ontario regional displays. P. Morra attended the Northeastern Ontario Regional Symposium and presented a poster display highlighting activities in the District and providing recommendations to prospectors at the symposium held in Timmins in April.

The office responded to 836 visitors and 2274 telephone calls during the year. The Drill Core storage facility received 17 visitors.

The Sault Ste. Marie District office initiated a program of validating, editing and deepening the Mineral Deposit Inventory (MDI) database. 723 records were validated, edited and deepened. 19 new records were added and 50 records were deleted due to duplication or because the records did not meet the MDI data criteria. Additional data from recent Ontario Geological Survey and Geological Survey of Canada publications deepened 65 records. This MDI program is ongoing and shall continue into next year.

Table 3. Property visits conducted by the Sault Ste. Marie District office 1999.

Number (keyed to Figure 2)	Property/Occurrence
1	Archean - Keweenawan unconformity – Kincaid Location and Prince Twp.
2	Coppercorp Mine – Montreal Mining Location
3	Daisey stone – Kincaid Location
4	Eagle Mine – Vankoughnet Twp.
5	Gilbertson Enterprises Quarry – Tarbutt Additional Twp.
6	Gimby occurrence – Kehoe Twp.
7	Goulais Bay pyroxenite – Fenwick Twp.
8	Island Copper prospect – Aweres Twp.
9	J. Robert and M. Tremblay properties – Moen and Moggy Twps.
10	Kaolin – Montreal Mining Location and Ryan Twp.
11	Keweenawan felsic intrusion – Archibald Twp.
12	Lower Livingstone Creek formation – Joubin Twp.
13	Mamainse Mine – McDonell Location
14	New outcrop of palesol at base of Matinenda Formation (Panel Mine) – Long Twp.
15	Nipissing gabbro, Basswood intrusion – Kirkwood and Wells Twps.
16	Nipissing gabbro, West Basswood intrusion – Bridgeland Twp.
17	Nipissing gabbro – Cobden Twp.
18	Nipisssing diabase – Deroche Twp.
19	Ontario Trap Rock Quarry – Plumnier Additional Twp.
20	Ophir Mine – Galbraith Twp.
21	Prace Mine – Vankoughnet Twp.
22	Rancourt Quarry – Gould Twp.
23	Tribag Mine and East Breccia Zone – Nicolet Twp.

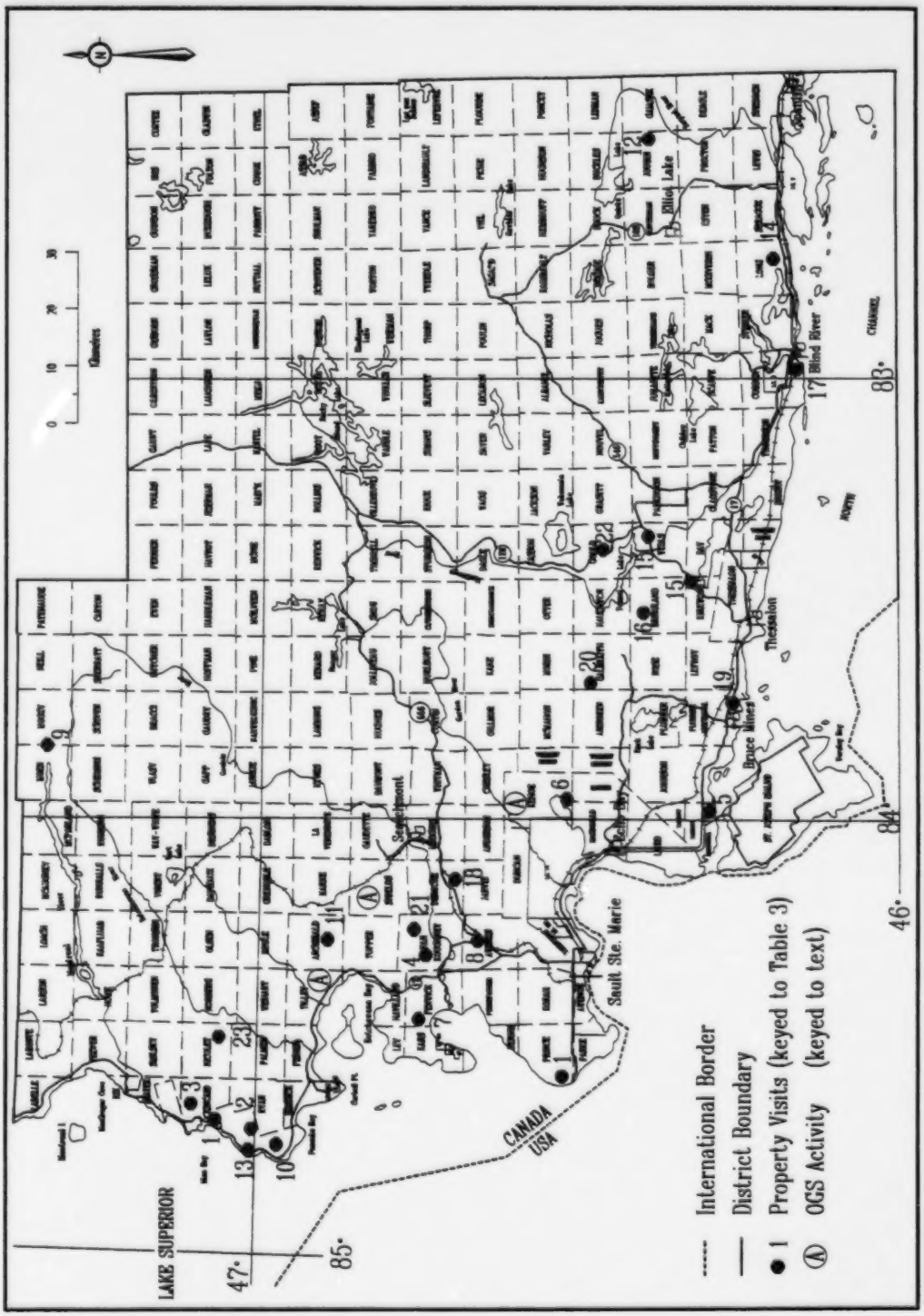

Figure 2. Sault Ste. Marie District, property and field examinations and OGS activities in 1999.

Property and Field Examinations

Major authorship for the following property visits is indicated in parentheses following the title.

J. Robert and M. Tremblay Properties, Moen and Moggy townships (B. Atkinson)

Timmins Prospectors J. Robert and M. Tremblay hold several large groups of claims in Moen and Moggy townships. The claims blocks were staked to cover areas of interesting geology with the potential of hosting both gold and base metal mineralization. Access to the area is by way of the Pineal Lake Road, from Highway 101 south of Chapleau. A newly constructed logging road extending from the Pineal Road crosses the property. The travel distance to the claims from Highway 101 is 88 km.

Glacial overburden is thin and consists of coarse sandy, boulder till. Bedrock outcrops are abundant and provide favourable prospecting opportunities.

Previous Work:

The area has been mapped at ½ mile (1:31 680) scale and is described in Geological Report GR 229 (Wilson, 1983). The Batchawana airborne electromagnetic survey covers the entire property (Ontario Geological Survey, 1990).

Several companies and individuals have explored the area in the past, but until this year's road construction, lack of access inhibited exploration. Airborne magnetic and electromagnetic surveys flown by Asarco Exploration Company of Canada Limited in 1973 roughly coincide with the Robert - Tremblay claim group in Moen Township. Asarco drilled three diamond drill holes in Moen Township and one in Schembri Township to the south in 1974. Between 1985 to 1991, Noranda Exploration Company Limited flew airborne geophysical surveys over parts of Moen and Moggy townships and did additional ground geophysical surveys and geological mapping. Several other companies carried out cursory exploration projects in the area.

Geology:

The property is underlain by Archean aged rocks of the Batchawana greenstone belt. Mafic metavolcanic rocks dominate the geology of the south half of Moen and Moggy Townships, while the north part is underlain by felsic intrusive rocks. The Troy Lake stock outcrops in the southwest corner of Moen Township. A small sliver of felsic volcanic rocks have been mapped between the Cow River and Bloor Lake (Wilson, 1983). Numerous northwest-trending Proterozoic diabase dikes intrude the area.

Roadside outcrops were examined during a property visit and are described as a series of field stops keyed to Figure 3. Lithogeochemical results of samples collected for analyses are presented in Tables 4, 5 and 6.

Stop 1: End of the road outcrops consist of intensely strained and mylonitized mafic flows. Quartz and quartz carbonate veins intrude the mafic flows. Foliation trends $070^0/90^0$. Kink band development suggests a sinistral shear component. The mafic flows carry 1 to 2% pyrite mineralization and exhibit carbonate and sericite alteration.

Stop 2: A blasted trench outcrop on the north side of road, 20m into bush, exposes mafic flows that are entirely carbonate altered, grey in colour and silicified with fine grained biotite alteration. The rocks contain 2 to 5% pyrite mineralization with minor chalcopyrite and possibly bornite. Mineral lineations on foliation planes plunge 015^0 west. The rocks exhibit strong shearing and the foliation varies from $090^0/80^0$N to $100^0/75^0$N. Narrow quartz veins in the mafic flows are boudinaged.

Stop 3: Creek quartz vein. A white quartz vein up to 20 cm wide hosted by mafic flows outcrops on the west side of a small south flowing creek. The vein carries very fine grained pyrite mineralization. A grab sample, 99BTA-31 from the quartz vein was collected for gold assay.

Stop 4: A two-foot wide quartz vein (Main quartz vein) occurs in intensely sheared intermediate to mafic flows. Black irregular wavy wisps of chlorite veinlets cross cut the quartz vein and minor sulphides of pyrite and chalcopyrite occur in the vein. The quartz has a sugary granular texture. The vein outcrops on both sides of the road and has a minimum strike length of 30m. The vein trends $090^0/85^0$N. Host rocks have horizontal mineral lineations. A small valley 20 m north of the vein trends eastward and may occupy a fault. Foliation and cleavage intensity of the rocks increase toward the valley. A parallel smaller quartz vein west of the main vein is discontinuous and boudinaged. Sample 99 BTA-32 was a grab sample collected to test the gold content of the large vein.

Stop 5: Roadside outcrops expose foliated mafic flows with large boudins of mafic dikes adjacent to medium grained diorite. Glacial striations on bedrock outcrops trend 050^0.

Stop 6: Approximately 3 km east of Stop 4, outcrops of mafic flows with iron carbonate alteration carry 1 to 3% disseminated pyrite mineralization. Mineral lineations plunge 020^0NW and foliation trends $100^0/90^0$. A 2.5 m wide greyish pink granodiorite dike intrudes the mafic flows.

Stop 7: 9 km east of Stop 1, a bright red gossanous hardpan soil, 0.3 m thick, overlies a fine grained siliceous felsic volcanic rock with disseminated pyrite mineralization. Samples 99BTA-33 and 99BTA-34 respectively of the red soil and the felsic volcanic bedrock were collected for assay.

Stop 8: 1 km east of Stop 7, a roadside outcrop of chert ironstone carries chalcopyrite and pyrrhotite mineralization. The ironstone is 1 m thick and trends $070^0/80^0$N. On the south side (footwall) of the ironstone, mafic flows outcrop while the hanging wall is a fine grained ultramafic rock. Samples 99BTA-35 and 99BTA-36 respectively of the ultramafic rock and chalcopyrite-rich ironstone were collected for assay.

Stop 9: Outcrops of mafic volcanic rocks host a 1m wide ironstone trending $082^0/80^0$N (Possibly the same ironstone viewed at stop 8). The footwall to the ironstone is a 23 cm thick bed that is composed of coarse black radiating grunerite with intergrown pyrite. Malachite staining was observed on one specimen. Samples 99BTA-37, 99BTA-38 and 99BTA-39 respectively of grunerite + pyrite, chert + sulphides, and of the mafic hanging wall were collected for analyses (Geoscience Laboratories, Ontario Geological Survey).

Stop 10. Sample 99BTA-40 medium grained green gabbro outcrops under a hydro transmission line and carries quartz veins mineralized with hematite (variety specularite) and minor chalcopyrite mineralization.

Table 4. Gold and base metal analyses from select samples from Moen and Moggy townships.

	Field Stop Location (keyed to Figure 3.)	Sample Description (Field Name)	Ag	Cu	Zn	Au
Units			oz/ton	ppm	ppm	oz/ton
Detection Limit			0.1	5	2	0.01
Sample No						
99BTA-31	3	Quartz vein grab	-	-	-	N.D.
99BTA-32	4	Quartz vein grab	-	-	-	N.D.
99BTA-33	7	Gossan soil	N.D.	264	58	N.D.
99BTA-34	7	Felsic volcanic	N.D.	5	14	N.D.
99BTA-35	8	Ultramafic	-	89	129	N.D.
99BTA-36	8	Chert	N.D.	639	458	0.03
99BTA-37	9	Grunerite + chert	N.D.	636	358	N.D.
99BTA-38	9	Chert	N.D.	51	42	N.D.
99BTA-39	9	Mafic volcanic	-	-	-	N.D.
99BTA-40	10	Iron carbonate vein	-	-	-	0.04

N.D.= Not Detected

Table 5. Whole rock geochemistry of select samples from Moen and Moggy townships.

Element	SiO2	Al2O3	MnO	MgO	CaO	Na2O
Units	wt%	wt%	Wt%	wt%	wt%	wt%
Detection Limit	0.01	0.01	0.01	0.01	0.01	0.01
99BTA-34	73.67	14.68	0.01	0.26	0.21	5.34
99BTA-35	48.67	14.13	0.19	5.77	7.45	1.19
99BTA-37	62.81	5.89	0.44	2.90	4.84	0.78
99BTA-39	48.56	14.60	0.25	6.48	6.67	3.66
99BTA-40	32.83	9.57	0.39	5.70	13.44	0.38

Element	K2O	P2O5	TiO2	Fe2O3	LOI	TOTAL
Units	wt%	wt%	wt%	wt%	wt%	wt%
Detection Limit	0.01	0.01	0.01	0.01	0.05	n/a
99 BTA-34	1.97	0.07	0.14	1.17	1.24	98.76
99 BTA-35	0.21	0.10	1.48	15.36	5.93	100.48
99 BTA-37	0.27	0.09	0.29	19.02	2.59	99.92
99 BTA-39	0.86	0.07	1.05	14.08	3.58	99.86
99 BTA-40	1.46	0.07	0.73	13.20	16.93	94.70

Table 6. Lithogeochemical results of select samples from Moen and Moggy townships.

Sample No	Description	Field Stop No	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm
99 BTA 34	Felsic volc	7	38 89	82.80	11.10	35.82	5.00	0.99	2.72	0.39	2.11	0.40
99 BTA 35	Ultra mafic	8	4.80	12.40	2.12	10.39	3.40	1.27	4.30	0.83	5.04	1.18
99 BTA 37	Gruneri te	9	6.83	13.34	1.77	6.59	1.42	0.71	1.39	0.24	1.46	0.35

Sample No	Description	Field Stop No	Er ppm	Tm ppm	Yb ppm	Lu ppm	Rb ppm	Sr ppm	Nb ppm	Cs ppm	Hf ppm	Ta ppm
99 BTA 34	Felsic volc	7	1.18	0.19	1.22	0.21	48.72	218.8	7.46	1.05	3.32	0.44
99 BTA 35	Ultra mafic	8	3.12	0.50	2.85	0.48	6.03	189.0	3.88	0.37	0.82	0.27
99 BTA 37	Gruneri te	9	1.01	0.16	1.02	0.19	13.51	76.7	1.78	4.45	1.18	0.15

Sample No	Description	Field Stop No	Th ppm	U ppm	Y ppm	Zr ppm
99 BTA 34	Felsic volc	7	8.29	1.89	11.50	101.35
99 BTA 35	Ultra mafic	8	0.41	0.11	30.64	26.87
99 BTA 37	Gruneri te	9	1.14	0.28	9.92	36.91

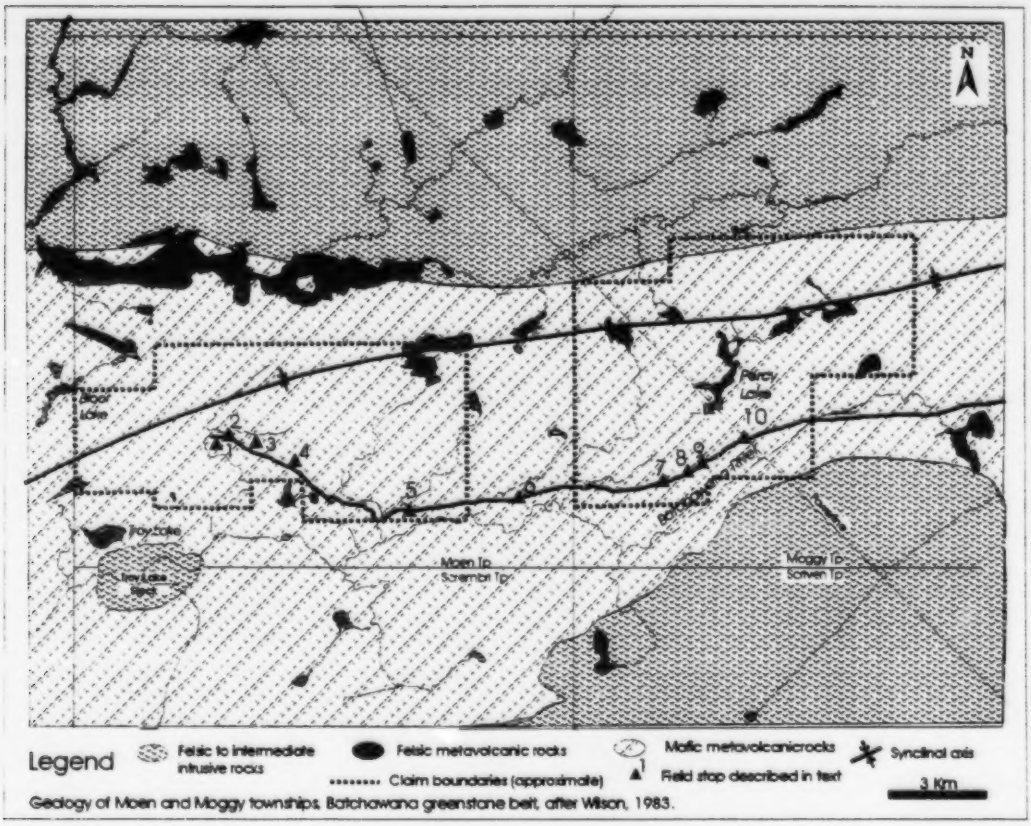

Figure 3. Geology of Moen and Moggy townships, Batachawana greenstone belt (modified from Wilson, 1983).

C.Ravnaas and P. Morra conducted a reconnaissance sampling project targeting platinum group element (PGE) potential focussed on four Nipissing gabbro intrusions within the district during the fall of 1999. The sampling procedure attempted to obtain a stratigraphic cross section of the Nipissing gabbro intrusions concentrating on changes in lithology, silicificaltion, alteration and mineralization. Global Positioning Satellite (GPS) readings were taken at all sample locations. Any Nipissing gabbro intrusion that returned anomalous results from District staff sampling shall be re-examined in greater detail in the future.

Basswood Nipissing Gabbro (C. Ravnaas)

Three Nipissing gabbro intrusions between Thessalon and Highway 129-554 junction were sampled in late October. Highway 129 provided the best access across the intrusions. P.C. Lightfoot et al. (1996) conducted an extensive sampling project of the three Nipissing gabbro intrusions. Analytical data for the Nipissing intrusions did not include PGE results. There has been no past PGE exploration activity over the three Nipissing gabbro intrusions.

Northern intrusions:

The northern Nipissing gabbro located in Wells Township was only exposed in two outcrops. The gabbro is located approximately 300 m north of the bridge over the Mississauga River. Highway 129 crosses approximately 750 m of the northwest-southeast trending Nipissing gabbro. A total of four samples were collected. Massive quartz diabase with 1 to 5 % disseminated pyrite returned values of 15 ppb platinum and 288 ppb palladium (Geoscience Laboratories, Ontario Geological Survey). It was not determined if the quartz diabase was the upper or lower quartz diabase as shown in Figure 7 (*see* Recommendation for Exploration: Platinum Group Element Potential). Further field work to evaluate the stratigraphic location of the outcrop exposures and additional sampling is planned for the future.

Middle intrusion:

The middle Nipissing gabbro located in Bridgeland and Wells townships is the largest in area within the Sault Ste. Marie District. Highway 129 crosses approximately 13 km of the east west trending Nipissing gabbro. The Nipissing gabbro ranged from gabbro to variable textured gabbro to granophyric gabbro. Several, 1 m in diameter, pods of sulphides within the variable textured gabbro were observed and sampled. The pods contained 5 to 10% coarse grained to cubic pyrite. Eighteen samples obtained from the middle Nipissing gabbro returned background PGE values.

Southern intrusion:

The southern Nipissing gabbro consisting of hypersthene gabbro is located in Kirkwood Township. The trend of the gabbro parallels the middle Nipissing gabbro. Highway 129 crosses 500 m of gabbro, but due to limited outcrop exposure only three samples were obtained that returned background PGE values.

Located north of and between the 3 sampled Nipissing gabbro exposures are the rocks of the Gowganda Formation of the Huronian Supergroup Sedimentary rocks. Rocks of the Lorrain Formation are located south of the southern Nipissing gabbro.

West Basswood Nipissing Gabbro (C. Ravnaas)

The West Basswood Nipissing gabbro intrusions located in Bridgeland and Wells townships were accessed along a bush road that extends from the Town of Little Rapids north toward Tunnel Lake. The bush road parallels and provided western exposure of the Basswood Nipissing intrusions. The bush road is located approximately 1.5 km west of Highway 129 in the south and the distance from Highway 129 expands to 13 km in the north.

The road crosses the east-west trending southern and middle Nipissing gabbro for 300 m and 700 m respectively. The northern Nipissing gabbro is northeast southwest trending, 90° different in trend than the Basswood Intrusion's exposure along Highway 129. It is crossed by 300 m of the bush road.

Four samples of the southern, two sample of the middle and three samples of the northern Nipissing intrusions returned background PGE content in poorly mineralized semi massive gabbroic rocks. The West Basswood intrusion gabbros are finer grained, more massive and less mineralized than the gabbro exposed along Highway 129. There has been no past exploration activity and no further work is planned.

Nipissing Gabbro - Cobden Township (C. Ravnaas)

Nipissing gabbro sampled in Cobden Township is located south of the Mississauga River and Highway 17, approximately 5 km west of Blind River. The outcrop exposures were accessed by canoe from Highway 17 via the Mississauga River. The Nipissing gabbro is bounded to the south by the east west trending Murray Fault, to the north by Huronian Supergoup sedimentary rocks, the west by the Lake of the Mountain fault and the east by the Mississauga River.

Previous work:

The area has been mapped at ½ mile (1:31 680) scale and is described in Geological Report GR 20 (Robertson, 1964). Robertson's Map 2028 noted 2 pits and indicated copper mineralization within the Nipissing gabbro. Persons who excavated the pits are unknown since no record of exploration activity is documented in the vicinity of the pits.

Geology:

The area examined is a wedge underlain by Proterzoic Nippissing diabase exhibiting gabbroic and granophyric phases. The east west trending intrusion is bounded to the north and a portion of the south by Gowganda Formation sedimentary rocks. The Murray Fault bounds the south portion of the intrusion. South of the Murray Fault, intermixed Nipissing gabbro and Archean granite gneiss dominate the area. (Robertson, 1964). The pits Robertson noted were not located.

The target of the property visit was to obtain samples and determine the PGE potential. The exposure of Nipissing gabbro is limited, approximately 300 m wide and two traverses from the shore of the Misissauga River south to the CPR rail bed were conducted. The two traverses were approximately 500m apart. Eight samples of granophyric gabbro collected averaged 1 % disseminated, fine grained pyrite. The rocks of this Nipissing gabbro did not show strain normally associated by the close proximity of faults. There has been no past exploration activity covering this Nipissing gabbro and the PGE results were not available at the completion of this report.

Gimby Occurrence – Kehoe Township (C. Ravnaas)

The Nipissing gabbro sampled is located in Section 4 of the south part of Kehoe Township, 20 km east of the City of Sault Ste. Marie, Ontario. An all weather road extends from Echo Bay, and parallels the south boundary of Kehoe Township, providing access. Permission from the landowner was obtained to access the Gimby occurrence.

Previous work:

The area has been mapped at ½ mile (1:31 680) scale and is described in Geological Report GR 210 (Bennett, 1983).

Eight pits located along a northwest-trending mineralized zone returned anomalous copper and cobalt mineralization. The mineralization is reported to be associated with fractures and quartz veining in Nipissing gabbro. In 1955 Sylvanite Gold Mines Limited reported grab samples from pit 1 to assaying 3.14% copper and 7.1% and 2.26 % cobalt from fresh diorite (assessment file SSM office, Kehoe 0012). Later in 1955 Pitch-Ore Uranium Mines Limited drilled six holes totaling 191 m. The diamond drill core was not found but two drill collars were located. Drill logs indicate the predominate rock type at the pits is granodiorite. Assays reported are 0.5 % copper over a length of 0.63 m. and 0.68 ounces of silver per ton over a length of 0.6 m (assessment file SSM office, Kehoe 0010-A1). No further exploration work has been conducted over the property.

Geology:

Proterozoic-aged Nipissing gabbro rocks underlie the property. Metagabbro, granophyric gabbro and granophyre rocks in an east west trending Nipissing gabbro dominate the geology of the property. The purpose of the property visit was to locate and sample the numerous pits and adit. Sampling of the pits by District staff confirmed the documented copper and cobalt results. Cobalt, copper and nickel results from pit 1 and pit 2 are related to quartz veins or quartz flooded dioritic to gabbroic phases of the Nipissing gabbro. Copper mineralization near pit 3 and pit 4 are related to fracturing within the quartz flooded Nipissing gabbro. The Nipissing gabbro rocks adjacent to the pits were sampled for PGE content. The PGE results were unavailable at the time of compilation of this report.

Table 7. Sample descriptions from Gimby occurrence, Kehoe Township (keyed to Figure 4).

Location	Description W-width, L-length, D-depth of pits	Assay Results (ppm)
Pit 1	W-2.5, L-3, D-2 m Intermixed quartz vein and quartz diorite at the south end of pit. The north end was covered by overburden. Results are from a sample of a 1 m wide quartz vein mineralized with 1% disseminated pyrite. The quartz vein strikes 020°, dip undetermined and trends toward pit 2.	Co 4699 & 1409 Cu 1030 Ni 950 & 138 As 13 820 & 2294
Pit 2	W-3, L-5, D-3 m. Located 10m. north of pit 1. The quartz vein exposed in pit 1 is not observed in pit 2. Quartz flooded gabbroic phase of the Nipissing gabbro with 1% finely disseminated pyrite was sampled.	Cu 500
Adit	W-2, H-3 m. An adit drifted 5 m. horizontal is located at the base of a Nipissing gabbro hill. The adit is following a vertical fracture observed on the back. Several 5 cm. flat quartz veins were observed along the south wall. The quartz veins and fracture were not mineralized.	No significant results
Pit 3	W-4, L-5, D-4 m Pit 3 is located above the adit and exposed a granodioritic phase of the Nipissing gabbro. Malachite staining, 5% pyrite and 1% chalcopyrite in a fracture was observed on the north wall. The fracture strikes 150°, dips 80°W and trends toward Pit 4. The accompanied result is from a quartz flooded granodiorite on the hanging wall side of the mineralized fracture.	Cu 9904
Pit 4	W-2, L-2, D-1.5 m Pit 4 is located 10 m north of pit 3. A 2m wide zone of quartz flooded granodiorite with 5% finely disseminated pyrite mineralization returned the accompanied assay. The fracture observed in pit 3 extends to pit 4 but no malachite staining was observed.	Cu 7778

Approximately 200 m southwest of pit 1 and 2, at the crest of the Nipissing gabbro hill, looking south toward the road and the Huronian Supergroup sedimentary rocks, a 20 m long by 2 m wide quartz vein was located. The quartz vein intermixed with the surrounding Nipissing gabbro trended 100°. There was low sulphide content but a sample of the quartz vein returned 1549 ppm cobalt, 2091 ppm copper, 139 ppm nickel and 2004 arsenic (Geoscience Laboratories, Ontario Geological Survey). This quartz vein was not documented in past exploration activity. The surrounding Nipissing gabbro was an unaltered, fine grained, non-mineralized gabbro. Limited small quartz veins were observed within the gabbro.

A small 1m outcrop of quartz flooded gabbro was observed at the base of the Nipissing gabbro hill. A sample with malachite staining and 1% finely disseminated pyrite returned 7576 ppm copper but only background values in cobalt (Geoscience Laboratories, Ontario Geological Survey). The quartz flooded gabbro was not documented in past exploration activity. Further fieldwork to prospect the location of the quartz zones at the base and at the crest of the Nipissing gabbro hill combined with additional sampling is planned for the future.

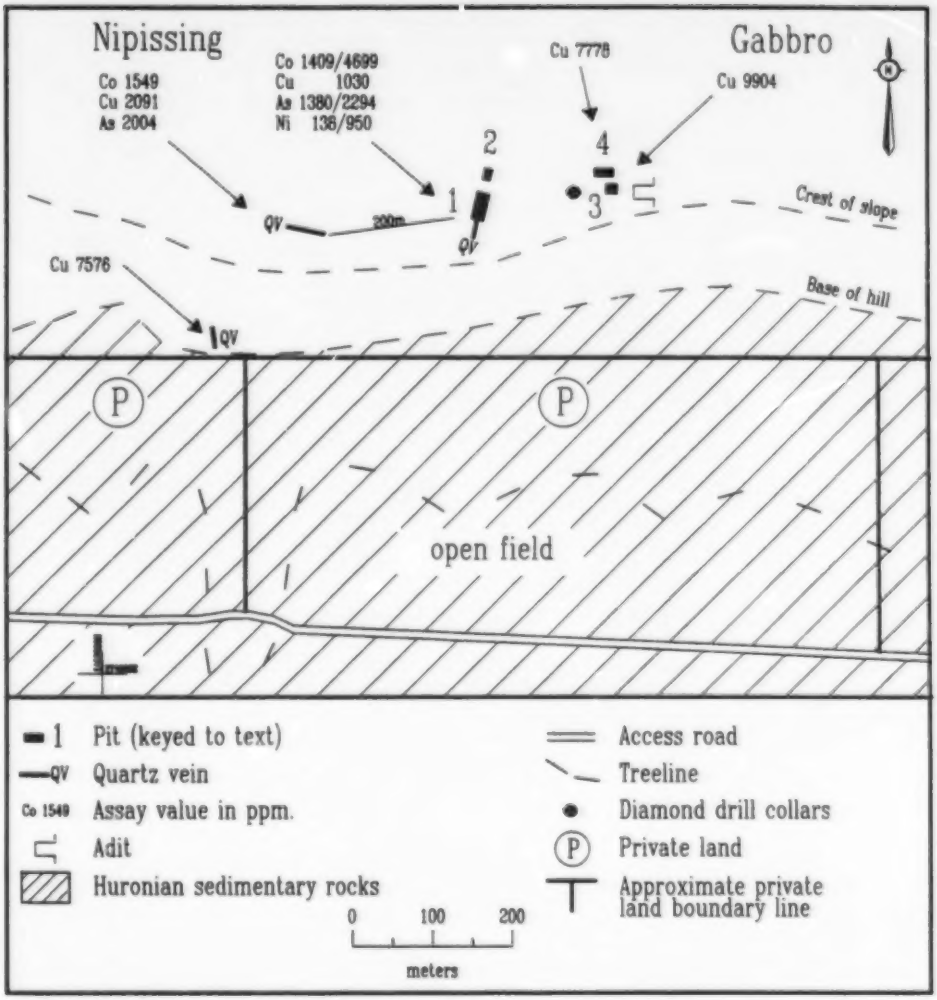

Figure 4. Pits and selected sample locations from Gimby occurrence – Kehoe Township.

Lower Livingstone Creek Formation – Joubin Township (C. Ravnaas)

District staff sampled two outcrops of Livingstone Creek Formation as described in Hailstone (1998). The area can be accessed from Highway 108, approximately 7 km south of Elliot Lake. East of Highway 108 the Nordic Road connects to the Pecors Road. Distance to the outcrops is approximately 13 km from Highway 108. The outcrops are located 200 m north of Pecors Road and 100 m south of Pecors Lake.

Previous Work:

The most recent mapping of the area at 1: 15 000 scale is described in Open File Report 5883 (Jensen, 1994). Previous Ontario Geological Survey work conducted over the area is documented in Byron (1994 and 1992) and by Robertson (1961).

The area underlain by the Livingstone Creek Formation was subjected to uranium exploration work by Rio Algom Ltd. in 1955. Most exploration work performed in the Pecors Lake area targeted uranium in the north and gold and base metals in the Whiskey Lake greenstone belt to the south and east. Since 1958 the area has been patented mining lands and additional exploration work was not recorded.

Geology:

The Proterozoic Livingstone Creek Formation is the oldest known sedimentary unit in the Huronian Supergroup rocks. Hailstone (1998) described the Livingstone Creek Formation outcrops as "1.5 m of the pyritic conglomerate overlain by 0.5 to 1m of heterolithic, clast supported granite boulder conglomerate. The contact between the boulder conglomerate and the lower pyritic unit is gradational. The beds strike approximately 80-85° and dip 10-15° to the north". Hailstone (1997) identified the sampled outcrops in this report as site C.

The pyritic bed was observed in the two outcrops and eighteen samples collected were analysed to determine the gold content. A stratigraphic section of the pyritic beds was developed from the sampling project. Sampling concentrated on the finer grained matrix of the conglomerate, with particular attention towards the pyrite and quartz content. Only background gold values were obtained from collected samples (Geoscience Laboratories, Ontario Geological Survey).

RECOMMENDATIONS FOR EXPLORATION

Moen and Moggy townships, Batchawana greenstone belt

As a result of new forest access road construction, the Moen and Moggy townships area is readily accessible for prospecting. Examination of outcrops along a new logging road (*See* Property Examinations: J. Robert and M. Tremblay Property), suggest this under-explored area has high potential for hosting both gold and volcanogenic massive sulphide mineralization. The presence of numerous large quartz veins with accompanying intense structural deformation and alteration indicates the rocks of the area have experienced similar geological processes to gold-producing areas. Several samples collected during a property visit to the area were gold-bearing. Equally exciting is the presence of grunerite mineralization associated with ironstone and previously unmapped felsic volcanic rocks in the western part of the Batchawana greenstone belt. The area should be considered a high priority for further exploration attention.

Building Stone Potential

Felsic intrusive rocks located adjacent to and within the Batchawana greenstone belt are unexplored building stone potential areas. The recommended area comprises part of the Ramsay Gneiss Domain and the Algoma Plutonic Domain. Exploration has historically concentrated on gold, silver and base metal potential of the Batchawana greenstone belt with limited exploration conducted over the felsic intrusive rocks.

The recommended building stone sites are accessible from forest operation roads. A paper copy of the entire road and railroad network is available for viewing at the Sault Ste. Marie District Geologist Office. Portions of the following sites may be subject to Ontario Living Legacy and special regulations could occur in the future.

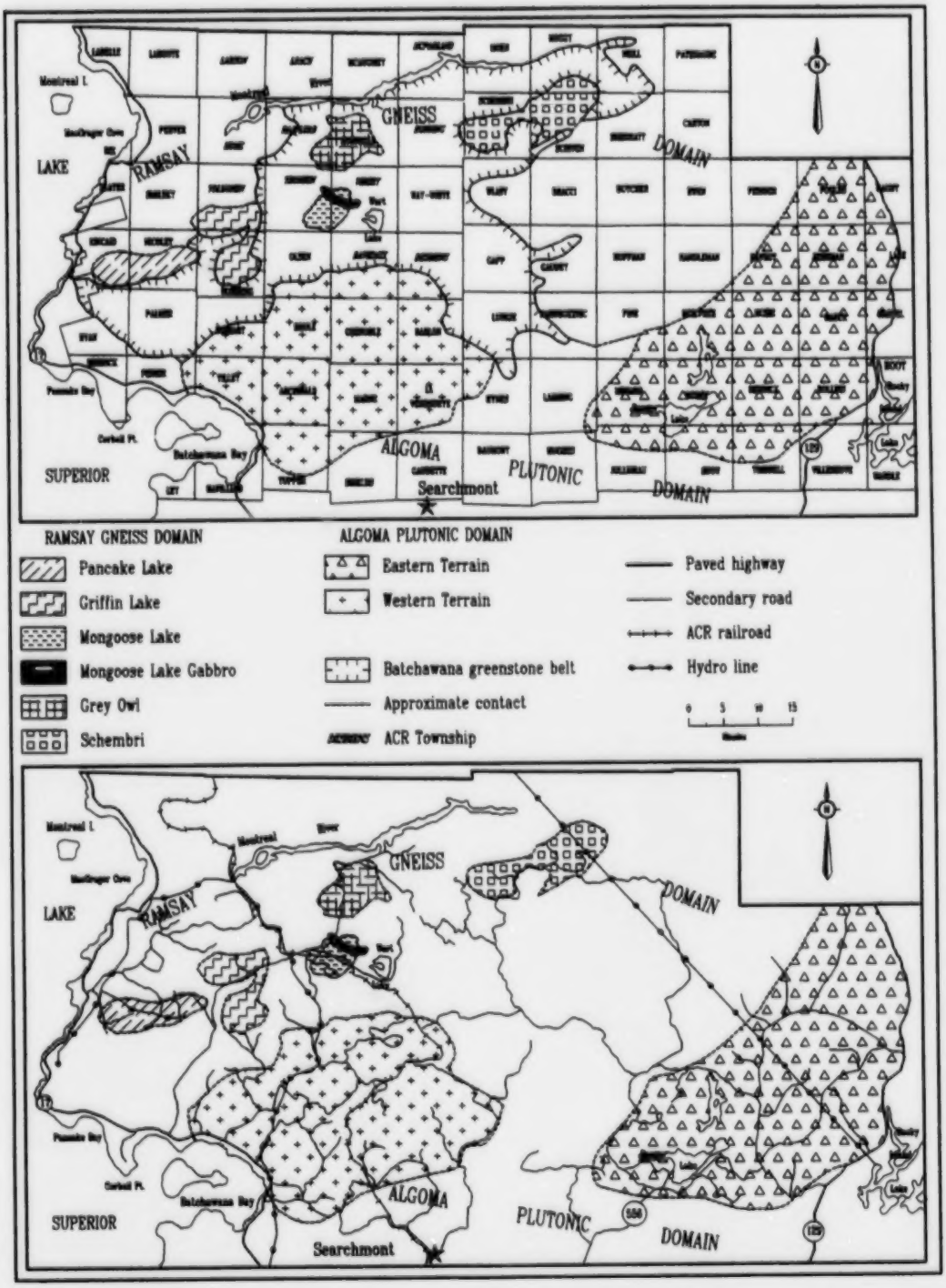

Figure 5. Building stone potential sites and road access (modified from OGS 2543).

Ramsay Gneiss Domain

Previous work:

The area has been geologically mapped and reported on in numerous government publications as noted in Table 8. The Batchawana airborne electromagnetic survey covered the Batchawana greenstone belt and part of the stocks recommended (Ontario Geological Survey, 1990). An airborne magnetometer, electromagnetic and resistivity survey flown by Manwa Exploration Services in 1984 covers the stocks located north of the Batchawana greenstone belt.

Geology:

The felsic intrusive rocks with the best building stone potential are stocks located within and those to the north and east of the Batchawana greenstone belt. These granitic rocks range from quartz monzonite to quartz diorite in composition and are equigranular to porphyritic in texture. The intrusions have deformed and displaced with minor assimilation the surrounding supercrustal rocks and lack late stage crystallization features such as pegmatites and aplites (Grunsky 1991).

Table 8. Building stone potential in the Ramsay Gneiss Domain.

Stock	Lithological Description	OGS Reports, Maps
Pancake Lake	Biotite, hornblende quartz diorite	OFR 5791, P3062
Griffin Lake	Massive quartz diorite which is pink to red. Grain size is 2 to 5 mm	GR 243, map 2479 OFR 5791, P3063
Mongoose Lake	Massive hornblende-biotite granodiorite and quartz monzonite. Grain size is 1 to 4 mm.	GR 243, 2480 OFR 5791, P3063
Mongoose Lake Gabbro	Massive hornblende gabbro, dark green. Medium to coarse grained and consist of equant interlocking crystal in a dark green to black colour.	GR 243, 2480 OFR 5791, P3063
Grey Owl	Massive pink to grey biotite quartz monzonite. Microcline porphyritic texture with grain sizes 10 to 40 mm.	GR 205, 2446 GR 243, 2480 OFR 5791, P3060, P3063
Schembri	Massive white to grey tonalite. The quartz content is 30% with the mafic content 5%	GR 229, 2478 OFR 5791, P3061, P3064

Algoma Plutonic Domain

Previous work:

The area has received limited OGS mapping, only Grunsky (1991) Open file Report with preliminary maps 3064 and 3063 cover a portion of the Algoma Plutonic Domain. Limited exploration work was conducted over the western portion and no exploration was ever reported over the eastern portion of the area. No exploration work has targeted the building stone potential of the area.

Geology:

The Algoma Plutonic Domain is located south of the Batchawana greenstone belt and extends from the shore of Lake Superior east to the Chapleau Highway (129) and north of the Ranger Lake Road (556). This domain is subdivided into a Western Granodiorite Terrain and Eastern Granitic Terrain (Grunsky 1991). The western terrain includes some of the oldest rocks of the domain and is composed of leucocratic massive granodoirite to tonalite.

Algoma Central Railway (A.C.R.) Lands

Several townships included in the area recommended for building stone potential are located within Algoma Central Railway (ACR) private lands. The ACR townships are identified in Figure 5 in italic font. ACR lands are now being managed by Wagner Ontario Forest Management Limited, who permit prospecting on their lands. The prospector must hold an ACR prospector's licence to prospect these townships. Map staking of 1 km square blocks replaces conventional staking on ACR land. Upon staking the prospector enters into a mineral exploration agreement with Wagner that requires a monetary fee plus work commitments. A mineral licence may be obtained for advanced exploration and mining. Details of the licencing procedures and fees may be obtained from Wagner Ontario Forest Management, 71 Black Road, Unit 8, Sault Ste Marie, On. P6A 6J8 (J. Walmsley, personal communication, Wagner Ontario Forest Management, January 24, 2000).

Cobalt Mineralization in Kehoe Township

Past mineral exploration at the Gimby Occurrence in Kehoe Township, concentrated on the copper and cobalt mineralization located exposed in numerous pits. The presence of anomalous cobalt mineralization in quartz veins within the Nipissing gabbro warrant further investigation. District staff sampling during a property visit located three separate locations that produced significant cobalt values. Assay results indicate a correlation between cobalt and arsenic mineralization. (*See* Property Examination: Gimby Occurrence – Kehoe Township). During the property visit, anomalous cobalt assays were obtained at the base and crest of the Nipissing gabbro hill. Numerous quartz boulders were observed in the talus slope of the hill. Exploration should concentrate on locating additional quartz veins in the Nipissing gabbro intrusion. Part of the Nipissing gabbro is located on patent land, permission from the owner is required to access part of the recommended area.

Pegmatite – Rare Earth Elements Potential

The National Reconnaissance Lake Sediment survey returned elevated Rare Earth Element (REE) values from lakes sampled near the Montreal River area (Fiske et al. 1991). Pegmatite dikes within the Ramsay Gneiss Domain are a potential exploration target for REE's.

Migmatic rocks of the Ramsay Gneiss Domain hosting documented pegmatite lie north of the Batchawana greenstone belt, east of Highway 17 to the McParland Township line. Grunsky (1981) located pegmatite up to 5m in width in migmatic rocks north of Montreal River. Siragusa (1986) located biotite bearing pegmatite in quartz monzonite rocks south of the Montreal River and north of the Batchawana greenstone belt. There has been limited exploration activity over the Ramsay Gneiss Domain and no documented evaluation of potential REE within pegmatite.

The rare earth element potential sites are accessible by forest operation roads as illustrated in Figure 6. A paper copy of the entire road and railroad network is available for viewing at the Sault Ste. Marie District Geologist Office. Portions of the following sites may be subject to Ontario Living Legacy and special regulations could occur in the future

Algoma Central Railway (A.C.R.) Lands

Several townships included in the area recommended for rare earth element potential are located within Algoma Central Railway (ACR) private lands (*see* Recommendations for Exploration, Building Stone Potential).

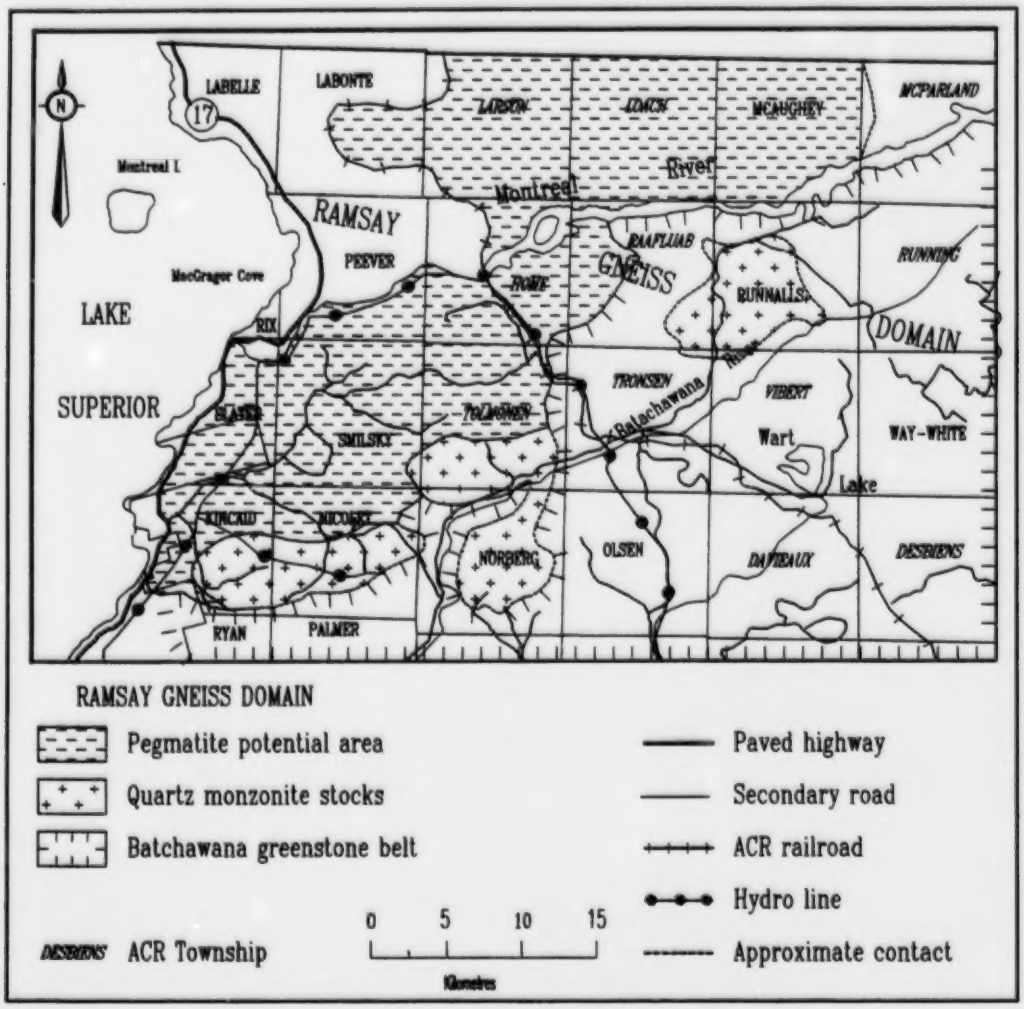

Figure 6. Pegmatite – Rare earth element potential (modified from OGS map 2543).

Platinum Group Element in Nipissing Gabbro Intrusions

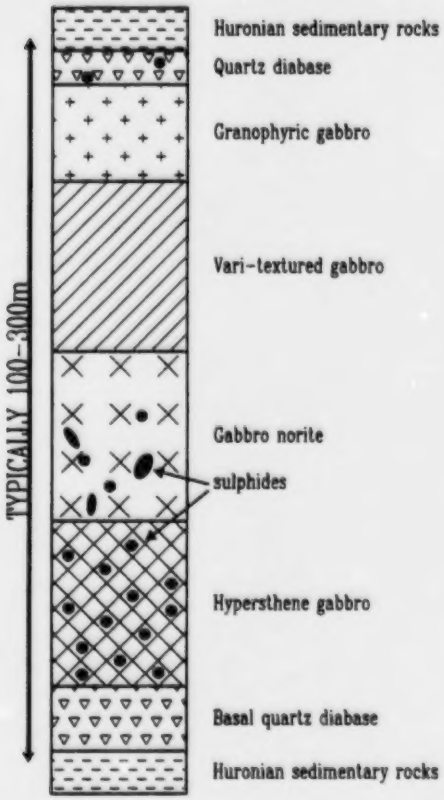

Figure 7. Typical sequence of a Nipissing gabbro showing the petrology and associated mineralization (modified from Lightfoot, 1996).

Nipissing gabbro intrusions provide excellent exploration targets for economic Cu-Ni-PGE suphide mineralization. There has been only limited exploration for platinum group element (PGE) within the Nipissing gabbro in the District. Active platinum group element exploration by Pacific Northwest Capital Corp. at the Janes Township Property located southeast of Sudbury is concentrating on the mineralized contact zone of the Nipissing diabase and the Gowganda Formation (*press release*, Pacific Northwest Capital Corp., December. 16 1999). Research by Jobin-Bevans et al. (2000) on diamond drill core from the Janes Property confirmed the presence of Cu-Ni-PGE sulphide mineralization within the hypersthene-bearing gabbro phase of a Nipissing diabase. The sulphide mineralization is located within 10-20 m of the lower Gowganda Formation and Nipissing diabase contact.

Sampling by District staff located a 288 ppb palladium value in a Nipissing gabbro intrusion north of Thessalon (*See* Property Visits: Basswood Nipissing Gabbro). Copper mineralization within Nipissing gabbro should warrant initial investigation for PGE content. Quartz-carbonate vein hosted copper mineralization in Nipissing gabbro is not recommended as a exploration target for platinum group elements.

OGS ACTIVITIES AND RESEARCH BY OTHERS

One Ontario Geological Survey field project was conducted in the Sault Ste. Marie District in 1999. For the location see Figure 2.

A) Rowell, D., Sedimentary Geoscience Section, OGS, Aggregate Resources Inventory of the Sault Ste. Marie Area.

Table 9. Publications received by the Sault Ste. Marie District Office in 1999.

Title	Author	Type and Year of Publication
Summary of Field Work and Other Activities, 1998		OGS MP 169, 285p., 1999
Report of Activities 1998, Resident Geologist Program, Red Lake- Kenora Districts	C.E. Blackburn, P. Hinz	OGS OFR 5987, 1999
Report of Activities 1998, Resident Geologist Program, Thunder Bay South District	Schnieders, B.R., Scott, J.F. and Smyk, M.C.	OGS OFR 5988, 1999
Report of Activities 1998, Resident Geologist Program, Thunder Bay North-Sioux Lookout Districts	Mason, J.K., Seim, G., White, G.D. and Bath, C.	OGS OFR 5989, 1999
Report of Activities 1998, Resident Geologist Program, Timmins-Sault Ste. Marie Districts	Atkinson, B.T., Hailstone, M.H., Wilson, A.C., Draper, D.M., Hope, P., Morra, P.M. and Egerland, D.C.	OGS OFR 5990, 1999
Report of Activities 1998, Resident Geologist Program, Kirkland Lake-Sudbury Districts	Meyer, G., Cosec, M., Grabowski, G.P.B., Guindon, D.L., Buckley, S. and Messier, C.L.	OGS OFR 5991, 1999
Report of Activities 1998, Resident Geologist Program, Southeastern and Southwestern Districts, Mines and Minerals Information Centre, and Petroleum Resources Centre	Sangster, P., Papertzian, V.C., Steele, K.G., Laidlaw, D.A., Stewart, J.M. and Carter, T.R.(MNR)	OGS OFR 5992, 1999
"Greenstone" Airborne MAG-EM Surveys and CD-ROMs for Batachawana Bay	ERLIS	OGS ERLIS CD-ROM 1034, 1999
Mineral Potential of Proterozoic Keweenawan Intrusions: Implications of Major and Trace Element Geochemical Data from Bimodal Mafic and Felsic Volcanic Sequences of Mamainse Point and the Black Bay Peninsula, Ontario	Lightfoot, P.C., Sage, R.P., Doherty, W., Naldrett, A.J. and Sutcliffe, R.H.	OGS OFR 5998, 1999
Summary of Field Work and Other Activities	Ayer, J.A., Baker, C.L., Kelly, R.I., Scott, G.M. and Thurston, P.C.	OGS OFR 6000, 432p. 1999
Mineral Deposit Modeling	Kirkham, R.V., Sinclair, W.D., Thorpe, R.I. and Duke, J.M.	GAC Special Paper 40
Institute on Lake Superior Geology	Minnesota Geological Survey	44 Annual Meeting, 125p., 1998

Table 10. Mineral deposits not being mined in the Sault Ste. Marie District in 1999.

Abbreviations

AF ..... Assessment Files
CMH ..... Canadian Mines Handbook
GR ..... Geological Report
MDC ..... Mineral Deposit Circular
MDIR ..... Mineral Deposit Inventory Record
MLS ..... Mining Lands, Sudbury
MR ..... Geological Survey Canada Publication
NM ..... The Northern Miner
OFR ..... Open File Report
PC ..... Personal Communication

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Pater Mine Sprague Twp 41J/2	Cu, Au, Ag	936 670 T @ 1.8% Cu	Rio Algom Limited.	MR 1087	Past Producer 1969-1970
Pronto Mine Long Twp 41J/2	U, Th	300 000 T U_3O_8 @ unspecified grade	Rio Algom Limited.	MR 223	Past Producer 1955-1960
Bar-Fin Mine Thompson Twp 41J/3	Cu	1906 - 130 foot shaft with 250 feet lateral work	Staked	MR 1087	Past Producer 1906
Bald Dome Prospect Plummer Add. Twp 41J/5	Cu	680 388 T @ 0.25% Cu		MR 1087	Inactive
Bruce Mines Plummer Add. Twp 41J/5	Cu, Ag	142 428 T @ 1.% Cu above 155-ft level.		MDC 12	Past Producer 1915-1921
Campbell - Dukes Prospect Plummer Add. Twp 41J/5	Cu	33 000 T @ 1.2% Cu in 230' by 8' by 220' block		MR 223	Past Producer 1956
Rock Lake Mine Aberdeen Twp 41J/5	Cu, Ag	1898-1903 420 foot shaft with 3 levels and 606 lateral development		MDC 12	Past Producer 1901-1903
Havilah Mine – Ophir Mine Galbraith Twp 41J/5	Au, Ag, Cu	1 main vein, 2 – 150 foot shafts, 1 – 183 foot adit		MDC 12	Past Producer 1892-1922
Steinberg Mine Plummer Add. Twp 41J/5	Cu	47 000 T @ 1.82% Cu or 124 000 T @ 1.1% Cu (drill indicated)		AF	Past Producer 1906 & 1956
Stobie Mine - Rainbow Mine Johnson Twp 41J/5	Cu, Ni, Au	9 T of ore shipped from 1 – 160 foot shaft with 20 feet of lateral workings		MDC 12	Past Producer 1899-1901

Deposit Name/ NTS	Comm-odity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Bilton Option Patton Twp 41J/6	Cu	453 593 T @ 1.7% Cu	N/A	MR 1087	Past Producer Pre 1956
Boyea Lake Adit and East Zones Montgomery Twp 41J/6	Cu	Adit Area - 128 000 T @1.95% Cu probable & possible to 200 ft.; East Area - 56 500 T @ 2.98% Cu drill indicated to 250 ft.	N/A.	Sudbury Contact Mines AR 1971	Past Producer Pre-1942
Crownbridge (Cannon) Prospect Kamichisitit Twp 41J/6	Cu	415 000 T @ 1.8% Cu diluted grade	N/A.	MDC 12	Past Producer 1966-1967
Glagoma Mine Gladstone Twp 41J/6	Cu	1917 2 shafts sunk to 250 feet		MDC 12	Past Producer 1917 & 1962
Goulding Mine Cobden Twp 41J/6	Cu	1962 816 T @ 1.4% Cu shipped from mine		MDC 12	Past Producer 1962
North Montgomery-Grand Portage Mine Montgomery Twp 41J/6	Cu	147 677 T @ 1.7% Cu – Main Zone 40 9000 T @ 1.96% Cu – No 1 Zone 77 063 T @ 3.23% Cu – No 2 Zone 61 688 T @ 1% cu – West Zone	N/A.	MR 1087	Inactive
Milgate (Abbican) Prospect Nouvel Twp 41J/6	Cu	95 934 T @ 1.08% Cu (drill indicated) A Zone L-600'/ W-10'/ D-235'		MR 1087	Inactive
Principle Strategic Minerals Prospect Gladstone Twp 41J/6	Cu	112 300 T @ 1.54% Cu (drill indicated)		NM MDC 12	Inactive
Sheba Prospect Nouvel Twp 41J/6	Cu	L-1000 ft. by W-3 ft. on surface @ 0.59% Cu	N/A.	MDC 12	N/A
Abeta - Pardee Zone Joubin Twp 41J/7	U	12 992 000 T @ 0.75 lbs/t U_3O_8 (drill indicated)	N/A	CMH 1978-79 MR 1087	Inactive
Banana Lake – Gemico Bouck Twp 41J/7	U	180 million T @ 0.7 lbs/t U_3O_8 (drill indicated)		MR 1087 MDC 25	
Buckles Mine Gunterman Twp 41J/7	U	486 500 T @ 0.124 lbs/t U_3O_8		MR 1087	Past Producer 1956-1958
Can – Met Mine Buckles Twp 41J/7	U	6 million T @ 0.1 lbs/t U_3O_8		MR 1087 MDC 25	Past Producer 1954-1960

Deposit Name/ NTS	Comm-odity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Canuc (M Keba) Bouck Twp 41J/7	U	7 million T @ 1.86 lbs/t U_3O_8 (drill indicated)		MR 1087	
Conecho Property Buckles Twp 41J/7	U	2 million T @ 1.4 lbs/t U_3O_8 over 6 ft. (drill indicated)	Rio Algom Mines Ltd.	MR 1087 MDC 25	Inactive
Denison Mine Bouck Twp 41J/7	U	5 zones with 25.7 million T @ 2.29 lbs/t U_3O_8	Denison Mines Ltd.	MR 1087 MDC 25	Past Producer 1957-1992
Genex Gunterman Twp 41J/7	U	11 000 T @ unstated grade U_3O_8		MR 223 MDC 25	
Lacnor Mine Gunterman Twp 41J/7	U	Proven - 551 623 T @ 0.106% U_3O_8; Probable - 1 million T @ 0.105 % U_3O_8; Drill indicated - 5 million T @ 0.111% U_3O_8	Rio Algom Mines Ltd.	MR 223 MDC 25	Past Producer 1958-1960
Millaqua Joubin Twp 41J/7	U	5.4 million T @ 0.07 lbs/t U_3O_8		MR 1087	
Milliken Mine Gunterman Twp 41J/7	U	6 million T ore produced 14 million lbs U_3O_8		MR 1087 MDC 25	Past Producer 1958-1964
Nordic Mine Gunterman Twp 41J/7	U Th, Yt	Proven - 831 000 T @ 2.10 lbs/t U_3O_8; Probable - 2.2 million T @ 2.07 lbs/t U_3O_8; Possible - 10 million T @ 2.13 lbs/t U_3O_8	Rio Algom Mines Ltd.	GR 57 MR 25	Past producer 1955-1968
Panel Mine Buckles Twp 41J/7	U, Th	8 967 000 T @ 0.12 lbs/t U_3O_8		MR 1087 MDC 25	Past Producer 1958-1961 1977 & 1979
Roche – North Rock Buckles Twp 41J 7	U, Th	6 million T @ 1.5 lbs/t U_3O_8		MR 1087 MDC 25 MR 223	
Silvermaque Property Gunterman Twp 41J/ 7	U, Au, Co, Cu	2.5 million T @ 2.2 lbs/t U_3O_8 (drill indicated)	N/A.	MR 1087 MDC 25	Inactive
Stanleigh Mine Gunterman Twp 41J/7	U, Th	Milled 2.5 million T ore yielding 5.9 million lbs U_3O_8		MR 1087 MDC 25	Past Producer 1958-1960 1983-1996
Stanrock Mine Buckles Twp 41J/7	U, Th,	10 million T @ 1.5 lbs/t U_3O_8		MR 1087 MDC 25	Past Producer 1958-1964
Twin Lakes Prospect Esten Twp 41J/7	Cu	Probable - 76 900 T @ 1.73% Cu over 8.04 ft.	N/A	MDC 12	

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Bi-Ore Mine Sagard Twp 41J/10	Cu	13 607 T @ 6% Cu	N/A.	MR 1087	Past Producer 1947-1949
Quirke No 1 Mine Bouck Twp 41J/10	Th, U, Ree	5 reefs with grades of 1.95 – 2.61 lbs U_3O_8	Rio Algom Mines Ltd.	MR 1987 MDC 25	Past Producer 1956-1971 1967-1971
Quirke No 2 Mine Bouck Twp 41J/10	U, Th	43.8 million T @ 2.41 lbs U_3O_8	Rio Algom Mines Ltd.	MR 1987 MDC 25	Past Producer 1968-1990
Cheney Mine Gould Twp 41J/11	Cu	39 405 T @ 3.97% Cu (drill indicated)	N/A.	MDC 12	Past Producer 1966-1967
Copper Prince Mine Kamichistit Twp 41J/11	Cu, Au	45 359 T @ 3% Cu 4 ore shoots near surface		MR 1087	Past Producer 1972
Jardun Mine Jarvis Twp 41K/9	Pb, Zn, Ag, Cu, Au	49 367 T @ 4.4% Pb, 3.1% Zn, 1.42 oz/T Ag	N/A	MDC 12	Past producer 1954-1957
Kerr Scott Deroche Twp 41K/9	Pb, Zn, Ag, Au	1859 T of hand-cobbed are recovered. Deposit reserves have not been calculated		MDC 12	Past Producer 1939
Goulais River Vankoughnet Twp 41K/11	Cu, Ag	250 000 T @ 2.35% Cu, 0.26 oz/T Ag in 3 zones (drill-indicated)	N/A	MR 223	Past Producer 1975 & 1981
Kristina Mine LaVerendrye Twp 41K/11	Cu	369 350 T @ 1.95% Cu in No 4 and No. 6 shaft zones	N/A.	MDC 12 MR 223	Past producer 1903-1907
Prace- Sill Lake Mine Vankoughnet Twp 41K/16	Pb, Zn, Ag	340 T Pb, Ag concentrate produced Deposit reserves have not been calculated	N/A.	PC	Past Producer 1981 & 1985-1987
Caputo – Just Wishart Twp 41N/1	Cu	475 T @ 11.18 % Cu recovered from 3 zones		MDC 12	Past Producer 1968
Coppercorp Mine Ryan Twp 41N/2	Cu, Ag, Au	1 360 777 T @ 1.7% Cu in C Zone 362 873 T @ 2.3% Cu in C-2 Zone 589 670 T @ 2.1% Cu in SB Zone 444 520 T @ Cu in Silver Creek Zone	N/A	MR 1087	Past Producer 1964-1972 1 M Tons recovered
Glenrock Palmer Twp 41N/2	Co, Au, Cu	Several zones – main zone L 250 ft. W 3.5ft. (drill indicated)		MR 1087 MDC 12	
Jogran Prospect Ryan Twp 41N/2	Cu, Mo	L-600 ft W- 400 ft D-680 ft @ 0.053% MoS_2, 0.19% Cu (drill indicated)		MDC 12 MR 223	

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Mamainse Mine Ryan Twp 41N/2	Cu	Vein L – 1500 ft W – 13 ft 3 shafts sunk to depth 60, 280, 1500 ft.		MDC 12	Past Producer 1882-1884
Maricona Prospect Slater Twp 41N/2	Cu	267 986 T @ 1.17% Cu reserves in 3 sections		MDC 12	
Pancake Lake Kincaid Twp 41N/2	Cu	L 300 ft W-21.5 ft D-200ft @ .76% Cu (drill indicated)		MR 1087	
Ranwick Peever Twp 41N/2	U	279 375 T @ 0.32 lbs/t U_3O_8		MR 1087	
Tribag Mine Nicolet Twp 41N/2	Cu, W, Ag, Au	2 267 961 T @ 1.6% Cu - Breton Zone 113 397 092 T @ .13% Cu, .27% Mo in East Breccia Zone 429 688 T @ 1.6% Cu – West Breccia 929 864 T @ 2.3% Cu - H Zone 907 184 T @ .2% W in Tailings – H Zone	Channel I	MR 1087 MDC 12	Past Producer 1967 –1973 Production from Breton & West Breccia Zones

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Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 023	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.307 951	cubic yards	1 cubic yard	0.764 554 86	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 962	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 747	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 622 6	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311 3	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 90**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	31.103 477	grams per ton (short)
1 gram per ton (short)	0.032 151	ounces (troy) per ton (short)
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.